No. 3197-A.

FROM

L. S. CAREY, ESQ., I. C. S.,

COMMISSIONER OF SETTLEMENTS AND AGRICULTURE,

Central Provinces,

TO

THE SECOND SECRETARY TO THE CHIEF COMMISSIONER,

REVENUE DEPARTMENT,

Central Provinces.

SUBJECT.
Report on the Nagpur Experimental Farm for the year 1895-96.

Dated Pachmarhi, the 22nd September 1896.

SIR,

I have the honour to submit the Annual Report on the Nagpur Experimental Farm for the year ending the 31st March 1896.

2. The rainfall of the season was in excess of the average of the last 21 years, but its distribution left much to be desired. From the middle of June to the end of August there was heavy rain, and prospects were at the close of the latter month in every way favourable. But the monsoon came to a very early end, and throughout the bulk of the Provinces the autumn was practically rainless. Moreover, during September and October the sky was for the most part unclouded, and the scorching rays of the sun rapidly dried up the ground and rendered the germination of the *rabi* crops a matter of difficulty. During November the temperature was abnormally high and the absence of the usual dews was a marked feature. Not a few then of the young seedlings which had struggled above the ground were withered up before they had forced their roots down to a sufficient depth in search of the moisture indispensable to their existence. December, however, ushered in a period of distinctly cold weather, and clear skies continuing the crops took a fresh lease of life and tillered freely. The outturn of the spring crops though in the main poor was better than could reasonably have been expected at one time, especially as the winter rains failed altogether. It is important, however, to notice that the Farm was more fortunate than most parts of the Provinces, in that it received some rain both in September and October, though the showers were decidedly light. That the crops were generally better than those obtained by agriculturists is not to be wondered at. This was essentially a year in which the advantages of careful tillage would manifest themselves, the complete pulverisation of the soil minimising evaporation by breaking the capillary tubes on the surface. The *kharif* crops did on the whole well. The conditions of the season were peculiarly suitable to cotton and til, and the yields of these crops were well above the average. Juar and tur fared less well, their outturns being somewhat reduced owing to the lack of moisture.

3. Another important feature of the year was the complete absence of all fungoid disease. The experiments then which were designed to throw light on the subject of Rust, and are alluded to under the head of "Plant diseases", failed to accomplish their object.

4. The experiments under the head of manures corroborate the experience of past years as to the beneficial effect of nitrogenous manures such as saltpetre and cowdung on wheat, and indicate that phosphatic manures in the shape of bone-dust add but little to the yield when unaccompanied by a nitrogenous manure. The latter manure when combined with irrigation has the effect in years like the present of enormously increasing the outturn, as evidenced by the following

figures taken from the A and B series. Some allowance must be made for the singularly poor yield of the unmanured dry crop in this field, for in field No 18 under similar conditions, 462 lbs. were obtained. But even if its outturn be doubled, the results are still striking:—

Class of Manure.	OUTTURN IN LBS. TO THE ACRE.			
	UNMANURED.		MANURED.	
	Dry.	Irrigated.	Dry.	Irrigated.
I Saltpetre	209	517	836	1,188
III Saltpetre and bone-dust ...	...	...	621	1,145
IV Dung	...	...	532	1,050
V Dung and bone-dust ...	...	...	632	1,294

It will also be noticed that the manured and irrigated plots yielded more than double the outturn of land which was irrigated without being manured. It is instructive to contrast with these figures the outturns of a series of crop experiments conducted this year under the orders of the Settlement Officer, Betul, a district where more is done in the way of manuring the wheat crop than in most parts of the Provinces.

Unmanured, dry.	Manured, dry.	Manured and irrigated.
650	780	1,010

In one case the outturn of the manured and irrigated land was as high as 1,230 lbs. The soil on which the Betul experiments were conducted was first class *morand*. This taken in connection with the fact that germination was more successful in the cooller climate of Betul, explains the much larger yield on the unmanured dry land in that district.

These figures indicate that the food-supply of the country can be materially increased by the proper conservation and application of manure in places where water is available for purposes of irrigation.

5. Owing to the absence of rain in the autumn, green manuring did not prove of any use, as the hemp failed to rot and become assimilable. This fact is observable in every experiment conducted with green manuring this season, with the sole exception of field No. 32 which, owing to its low-lying position, holds water until late in the year.

6. The manuring of land in August, when the heaviest bursts of rain are over and there is less likelihood of the nitrates being washed out of the soil, proved more beneficial than the usual agricultural practice of manuring in June. The results attained last year are thus corroborated, but this is manifestly an experiment which must be continued over a series of years before a definite conclusion can be arrived at.

7. The practical method of soil analysis by the use of chemical manures as devised by Mr. George Ville has been continued, with the substitution of linseed for wheat as the crop experimented on. It is hoped in this way to throw some light on the soil constituents required by linseed and to gain some insight into the disease known as *talap* which does much harm to this crop on the Farm.

The plot from which nitrogen was excluded gave a larger outturn than the others, and the results obtained in the C series of experiments point in the same direction.

The teaching then of the year is that linseed favours phosphatic rather than nitrogenous manures, but this point needs verification in subsequent years.

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8. The experiment in fields Nos. 40 and 55 of contrasting the effect on wheat of nitrogenous and non-nitrogenous crops might conceivably be amplified with advantage by the addition of a third plot to be left unmanured. Some idea might then be gained as to whether green manuring with a crop such as *ambari* confers any advantage on the subsequently-sown wheat crop.

9. The new experiment termed C series is designed to show the effect on linseed of different kinds of manure applied year after year. It has been started at Dr. Leather's suggestion. The crops obtained this year even in the unmanured plot were remarkably fine. But this field has not been under linseed for many years.

It remains to be seen how the crop will fare in subsequent years, for under the agricultural practice of the Provinces, linseed owing to its exhaustive properties, is rarely sown in the same field more often than once in six years or so. And it is clear, from the results obtained in field No. 57 under the head "IV—Rotations with linseed," that unmanured land cannot be cropped successively with linseed.

10. The single experiment in tillage continues to give consistent results from year to year, and it would appear more beneficial to plough the field every third year than merely to scarify it from year to year. On the other hand, ploughing every year is not attended with success. These results have hitherto been obtained in one field, and it is conceivable that treatment which might suit it would not be equally beneficial to fields somewhat differently circumstanced. I propose then to consult the Agricultural Chemist to the Government of India as to the expediency of transferring this experiment to another scene.

11. No less than seven varieties of cotton have been sown during the year under report, and this experiment is of special importance in view of the desirability of discovering a longer stapled variety which will do well in these Provinces. Though the yield of the ordinary *Jari* is heaviest, *Bani* and Nimari have proved equally profitable in the present year owing to the higher price they command.

The American varieties have done less well, and little success has hitherto been attained with the variety imported from Borneo. The staple of the Upland Georgian (American) is reported weak. Accordingly the effect of a strong manure upon this description of cotton is now being tried, and the present appearance of the crop is excellent. Last March sewage was pitted in a plot on the Farm on the system advocated by Conductor Meagher of Allahabad. Under this system the pits are dug very shallow, and are practically furrows, the soil at the bottom of which is loosened. Only a few inches of night-soil are deposited and the pits are then covered up. Chemical action takes place rapidly owing to the large surface of exposure, and within three months the land can be ploughed up and cropped.

The quality of the Cairo cotton, the seed of which was received from Mr. J. B. Fuller, C. I. E., was excellent, and was valued at Rs. 140 per boja of 345 lbs. as compared with Rs. 64 and Rs. 89, the prices placed on *Jari* and *Bani* the local varieties, by the Manager, Empress Mills. Only a small packet of seed was received, and the experiment is this year being prosecuted on a larger scale. While on the subject of Egyptian cotton it is noticeable that considerable interest has recently been aroused in native circles by the publication of a small pamphlet respecting the growth of Egyptian cotton in India, by Mr. Jamsetjee N. Tata of Bombay. This gentleman advances the theory that to approximate to the conditions under which cotton is raised in Egypt, it should be grown here as a *rabi* crop, and if necessary irrigated. He has supplied the Farm with seed, and it is now proposed to devote six plots to the experiment, three being irrigated and three unirrigated. One would be sown in September, a second in October, and a third in November. Should the experiment succeed to any extent, some idea will in this way be gathered as to the best season of sowing. This is a matter of considerable importance as it is apprehended that the crop will take

six months to come to maturity, and the effect on the crop of the hot winds of April and May may prove late sowing to be out of the question.

12. The rust resistant properties of *Mundia pissi* and *Dhana* wheat, the latter of which I picked up in Saugor, and which takes its name from its resemblance to the coriander seed, could not, as above explained, be tested in the season under report. But I have recently had confirmatory evidence from Jubbulpore as to the qualities of the latter description of wheat; and although it does not appear to be of very marketable description, still it is well from the point of view of the food supply of the country that the experiment should be persevered in. During the year another description termed *Bansi*, which claims to be rust proof, has been received from Mr. Crump, Deputy Commissioner of Hoshangabad. This will likewise be tried in the season now approaching.

Another stage has been reached by Mr. Joshi in his attempt to produce a rust resistant wheat by the cross fertilisation of various varieties. The best results were obtained from the combination of *Haura* and *Mundia pissi* and *Mundia* and *Katha*. The hybridization of *Katha* as the father with *Mundia* as the mother proved however abortive. The other varieties do not appear very promising, the complexion of the grain being somewhat peculiar.

13. In some parts of the Provinces, *e. g.*, the Lakhnadon tahsil of the Seoni district, much loss is occasioned in wheat by the disease known as *smut* (*kani*). Under these circumstances it is gratifying that the disinfecting of the seed in a solution of sulphate of copper prior to sowing has proved so successful on the Farm. This remedy has been communicated to the Settlement Officer of Seoni, in whose company I came across the disease in Lakhnadon, and he is taking measures to educate the people on the subject. The remedy is a cheap one within the means of any cultivator. Some help in the direction of enlightening the tenants may also be expected from the members of the Land Record staff, a few of whom have been through the Agricultural class, as also from the few village schoolmasters who have been instructed in the elements of agriculture at Nagpur. Prevention, however, is better than cure, and the cultivators have been urged to pluck up and burn all diseased ears. But at present they are not alive to the necessity, and do not appreciate that the disease must necessarily extend unless due precautions are taken.

14. There is not much to be said on the subject of implements. But Mr. Joshi has endeavoured to adapt the wheat sowing "*tifan*" or seed drill so that it should be possible to sow cotton with it. The difficulty at present is that the cotton seed sticks in the narrow bamboo tubes, when fed from a cup as in the case of wheat. Under the ordinary practice of the country it takes four persons to sow cotton, a man driving the bullocks and a woman feeding each of the three separate tubes attached to the drill. By substituting iron pipes radiating from one feeder Mr. Joshi has endeavoured to economise labour. I have had his improved *tifan* tested by practical cultivators at Nimar under the supervision of Mr. Montgomerie, I. C. S., who takes an interest in these matters. The people while approving the design hold that the implement is too heavy for the ordinary bullocks of the country. Some suggestions have been thrown out by Mr. Montgomerie, and Mr. Joshi is attempting to remove the defects.

15. The Jaunpur maize, the trial of which was advocated by Dr. Leather, has proved a success, and is deemed superior to the local variety. Seed has been distributed and some fine cobs were shewn to me last July by the Tahsildar of Lakhnadon. The seed will now be given out to any tenants who are disposed to give the new variety a trial. Another description known from the shape of the seed as horse-tooth maize has been obtained from Saharanpur and is being experimented with this season on the Farm.

16. On receipt of Secretariat letter No. 2905, dated the 1st July 1895, forwarding a note drawn up by Dr. Leather on the directions in which improvements in certain Court of Wards' estates might be introduced, and instructing me to place myself in communication with Deputy Commissioners as to the

arrangements that could be made in solvent estates in the direction of improving the breed of cattle and experimenting on small areas with imported seed, I addressed the Deputy Commissioners of 13 districts in which estates, with balances of some magnitude, were under management. The replies have not been altogether encouraging.

In several cases it is pleaded that owing to agricultural depression there are no funds available for improvements. In others it is alleged that the balances are merely nominal or are required to defray debts. In Bhandara the Kampta Estate has been restored to its owner.

All that has been done hitherto is to supply the Deputy Commissioner of Mandla with some Jaunpur maize seed, and the Deputy Commissioner of Nimar with some guinea-grass shoots. One of the Mysore bulls has been lent to an estate under the Nagpur Court of Wards; and the Deputy Commissioners of Betul and Mandla who profess readiness to purchase bulls for the improvement of the local breeds have been supplied with information on the subject. The record is certainly a meagre one, but some good may have been done in attracting attention to the matter, and with better seasons more progress may possibly be made. I am not however very sanguine in this respect, and hold that little will be done until we recruit our Court of Wards' Managers from a class of men who have some acquaintance with practical farming. It should surely be possible in course of time to find men who would combine these qualifications with some administrative ability.

17. This brings me to the subject of the Agricultural class in regard to which there has been much discussion latterly in connection with Sir Edward Buck's mission to these Provinces. Schemes have been formulated and submitted for the Chief Commissioner's consideration under which, if accepted, the standard of education qualifying for entrance to the class would be raised, and the door of preferment would be opened to students through the ranks of the Revenue Inspector class to the posts of Tahsildar, Naib-Tahsildar, Manager and Assistant Manager, Court of Wards, and the higher grades of the Land Record Department. In other words, a matriculate who had passed the final examination of the Agricultural class after a two-years course would be treated as on a par with one who had passed the F. A. examination. In this way it is hoped to attract a superior class of students to the Agricultural class and to increase its field of utility.

18. The Normal Agricultural class under Mr. Jakate has continued to do good work in imparting instruction in the rudiments of agriculture to village schoolmasters. I have, when on tour, examined the boys of several schools, the masters of which have been through the course. A considerable amount of interest is manifested in the subject by the parents of the boys and some of the resident malguzars. The boys themselves appear to have assimilated the instruction to a satisfactory extent in some instances, but perhaps more could be done by the masters in bringing home the lessons they have to impart to the boys if they occasionally took them into the fields. Moreover, the lessons should be invariably illustrated by the use of plants, &c., *i. e.*, *true* object-lessons are required. It does not, for instance, suffice for a boy to be able to describe from memory the disease of "*smut*", which would thus remain a mere abstraction in his mind. He should be able to identify it in the fields if any practical good is to result.

I also inspected some schools in which agriculture was taught from the prescribed text book, but by masters who had not been through the Agricultural course. The results were not satisfactory and the conviction was forced upon me that at our present rate of progress (we instruct only 66 masters per annum) we should never overtake the arrears of instruction, and the proportion of masters who had passed the class would remain very small. I communicated these views to the Inspector-General of Education, who has been good enough to draw up a scheme for the consideration of the Chief Commissioner, in accordance with which some 140 or 150 persons, some already on the educational staff, and others under training in the Normal School, would be annually trained.

19. In conclusion, I would beg to commend to the favourable notice of the Chief Commissioner the services of Mr. R. S. Joshi, who has continued to manifest the same assiduity, earnestness of purpose and initiative as in the past.

I have the honour to be,

Sir,

Your most obedient Servant,

L. S. CAREY,

Commr. of Settlements and Agriculture.

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No. 106.

FROM

THE SUPERINTENDENT,

GOVERNMENT EXPERIMENTAL FARM,

Nagpur,

TO

THE COMMISSIONER OF SETTLEMENTS AND AGRICULTURE,

Central Provinces.

SUBJECT:
Report on the Nagpur Experimental Farm for the year 1895-96.

Dated Nagpur, the 3rd July 1896.

SIR,

I have the honour to submit the Twelfth Annual Report on the working of the Experimental Farm, Nagpur, for the year ending the 31st March 1896.

2. The present arrangement of the report is the same as that of the previous year, and the order in which the different subjects are treated is as follows:—

I.—History of the Farm.

II.—Character of the Season during the year under report.

III.—Manure Experiments.

IV.—Rotation Experiments without Manures.

V.—Rotation Experiments with Manures.

VI.—Experiments with Mixture of Crops.

VII.—Experiments with Tillage.

VIII.—Variety of Crops.

IX.—Experiments with Plant Diseases.

X.—Method of Cultivation.

XI.—Trial of Implements.

XII.—Distribution of Seeds.

XIII.—Cattle-breeding.

XIV.—Experiments with Fodder and Forest Reserves.

XV.—Sewage Farm.

XVI.—Agricultural Class.

The subject headings Nos. IV and V have been slightly altered under the recommendation of Dr. Leather, and a new head "Distribution of Seeds"—No. XII, has been inserted.

I.—HISTORY OF THE FARM.

History.

3. The Nagpur Experimental Farm was established in 1883, in which year the former Model Farm was given up and the present site selected in its stead. The land is close to Nagpur and is of a moderately typical class of the kind which is to be found in the Central Provinces. It consists of a fairly level piece of land of about 90 acres in extent, out of which about 67 acres are under cultivation, the rest being occupied by roads, buildings and waste land. The soil is of the black-cotton type, but somewhat inferior. It varies in depth from 4 to 10 feet, and is situated upon a gneiss rock. The natural drainage is however bad, and kharif crops frequently suffer in consequence. The road to Ambajheri, which intersects the Farm, acts as a sort of embankment to hold up the water, but new drains have recently been opened, which appear to be answering the purpose for which they were designed.

II.—CHARACTER OF THE SEASON.

Season.

The following table compares the rainfall of the year as registered on the Farm with the average of the preceding twenty-one years :—

Rainfall 1895-96.

Month.	Number of rainy days.	Rainfall.	Average of twenty-one years preceding.	Month.	Number of rainy days.	Rainfall.	Average of twenty-one years preceding.
		Inches.	Inches.			Inches.	Inches.
				Total brought forward ...	50	51·00	43·99
April ... 1st half ...	1	·75	·10	October ... 1st half ...	1	·30	1·56
April ... 2nd half ...	2	·35	·21	October ... 2nd half ...	3	·99	1·57
May ... 1st half ...	1	·14	·24	November.. 1st half ...	...	...	·80
May ... 2nd half ...	1	·30	·27	November.. 2nd half ...	...	...	·20
June ... 1st half ...	2	·91	3·12	December... 1st half ...	...	...	·13
June ... 2nd half ...	9	9·06	4·92	December... 2nd half ...	...	...	·34
July ... 1st half ...	5	5·25	7·50	January ... 1st half ...	...	...	·41
July ... 2nd half ...	8	14·03	6·84	January ... 2nd half ...	..	...	·24
August ... 1st half ...	7	7·05	6·29	February... 1st half ...	...	...	·11
August ... 2nd half ...	7	9·65	4·86	February... 2nd half ...	...	...	·27
September. 1st half ...	5	1·69	5·01	March ... 1st half ...	...	...	·26
September. 2nd half ...	2	1·82	4·63	March ... 2nd half ...	...	·10	·22
Total carried over ...	50	51·00	43·99	GRAND TOTAL ...	54	52·39	50·10

NOTE.—A rainy day is taken as one on which there was a fall of not less than 10 cents.

The hot weather showers being scanty were of little use in facilitating the preparation of the land for the sowings of the kharif crops. The monsoon burst rather late and the actual sowing of the kharif crops commenced on the 27th of June. The rainfall of July and August was very heavy, but it in no way impeded the process of weeding by bullock hoe (Dowra and Dhundia). All crops, and especially cotton, showed signs of an extraordinarily healthy growth, and the September rains, which were very much below the average and as such very favourable to this crop, caused the cotton plants to form good bolls. The growth of juar (*Sorghum-vulgare*) was impeded to a considerable extent owing to the fields having little or no moisture in September and October. But, as was to be expected, the crops standing on light soil suffered most. Tur (*Cajanus Indicus*) being a tap-rooted plant, did not languish so much as juar from want of moisture, but had it received the usual quantity of rain during these months it would have produced a better outturn. As regards the rabi it is noticeable that the light rainfall of September afforded the cultivators a good opportunity of preparing the land for the spring crops. Til, which is practically a rabi crop in the south of the Provinces, was sown on the 5th of September and got a satisfactory start. The drought of the season suited this oilseed when sown in fairly rich soils, and on the Farm a bumper crop was harvested. The sowing of linseed commenced on the 30th of September and the sowing of wheat on the 10th of October. By those dates the soils had lost much of their moisture, the sky having been clear almost throughout the month and the rays of the sun most powerful. The later-sown seed failed in consequence to germinate satisfactorily. The early-sown wheat and linseed however germinated well. A fortnight after sowing the weaker seedlings withered from want of moisture. But the light rain which fell in the latter half of October somewhat improved prospects and assisted the plants that survived to establish themselves. This rainfall was not however sufficient for sowing purposes, as it was rapidly absorbed by the surface of the caked and thirsty soil. Those cultivators then who had postponed the sowing of wheat in the expectation of getting rain were forced to leave their fields fallow. From the end of November to the end of March not a drop of rain fell. The cold weather rainfall which is of such vital importance to the rabi harvest failed us altogether, and to make matters worse the heat during November was quite abnormal. At the end of this month prospects were exceedingly gloomy, for the usual morning dews which are so beneficial to young vegetation in these parts were conspicuous by their absence. At the beginning however of December decidedly cold weather set in with an unclouded sky and the crops improved from day to day and commenced to tiller freely. Ultimately the linseed and wheat crop gave a 12-anna yield on the Farm, which was more than at one time one

MAP OF
THE GOVERNMENT EXPERIMENTAL FARM
NAGPUR C.P.

Scale 5 Chains. 1 inch.

EXPLANATION.

Permanent Experimental Fields	
Temporary Do.	Do.
Non-experimental Do.	
Waste Land	
Farm Office and Godowns	A
Cattle-shed	B
Farm Superintendents quarters	C
Work shop	D
Manure-pits	E
Agricultural Class Buildings	F
Veterinary Dispensary	G

Drawn and Litho. Govt. Photozinco Office, Poona 1896.

would have cared to predict. The season was then one of exceptional drought, but the conditions were unfavourable to rust and other fungoid diseases. The quality of the spring crops left in consequence nothing to be desired.

III.—MANURE EXPERIMENTS.

Manure.

5. The different manures tried on the Farm fall into two classes, *viz.*, natural and chemical. The natural manures are:—

(1) Box-dung.
(2) Stall-dung.
(3) Saltpetre.
(4) Bone-dust.
(5) San-hemp (*Crotolaria juncea*) ploughed in green.
(6) *Psorolia corilifolia* (Bawachi).
(7) Ashes of cattle-dung.
(8) Ambari (*Hibiscus cannabinus*) ploughed in green.

The chemical manures are:—

(1) Ammonium chloride.
(2) Calcium superphosphates.
(3) Potassium sulphate.
(4) Calcium sulphate.

No description of chemical manures is necessary. That of the ordinary manures is given below.

(1). *Box-dung.*—Box-dung is prepared in the Farm in the following manner. A pit measuring 10′ × 10′ and 2′ × 6′ deep is dug in the cattle-shed and is brick-lined on four sides. A pair of bullocks are tied in the pit, while the other bullocks are stalled in the cattle-shed. The excrements (urine and dung) of the former fall in the pit and the little straw that is left uneaten in the manger is spread over the excrements in the morning when the bullocks are let out either for work or for grazing. It takes generally from five to six months for the pit to be filled up to the top. It is then carted away and deposited in an ordinary pit dug in the ground for storing manure. These pits are covered over with straw to check evaporation, and are watered occasionally in the hot weather between March and June. The manure is not used until the lapse of one year from the date of deposit. As this manure contains about one-half litter, a larger proportion is applied to an acre of land, *viz.*, 240 maunds compared with 160 maunds of stall-dung manure, which contains no litter.

2. *Stall-dung.*—The term stall-dung is applied to dung collected from the cattle-shed from day to day and stored in an ordinary pit. This manure is also covered over with straw and watered at intervals in the hot-weather. It contains no urine, but only the solid excrements of the bullocks without straw.

3. *Saltpetre.*—The saltpetre that is used on the Farm is crude saltpetre, obtained from Cawnpore through the Director of Land Records and Agriculture, North-Western Provinces and Oudh. It is of two descriptions, black crude, and white, which is a purer variety. The amount of saltpetre applied in the Farm is 240 lbs. to the acre, and it is, as a rule, drilled in with the seed. A sample similar to that used in the year under report was analysed by Dr. Leather, in the previous year—the results of this analysis are given in last year's report.

4. *Bone-dust.*—This manure is prepared in the following manner: bones of animals are pounded in a mill, such as is usually used for grinding lime (chunam). They are then passed through a sieve, and the fine powder resulting is applied at the rate of 360 lbs. to the acre, the method of application being the same as in the case of saltpere.

5. *San hemp* (crotolaria juncea) *ploughed in green.*—The seed of the hemp is sown broadcast at the beginning of the rains at the rate of 100 lbs. per acre. On the 15th of August as the plants approach maturity, they are uprooted by hand and are buried in the furrows made by the Swedish plough. The plant san hemp is one of the order *Leguminosæ*, sub-division *papilionacæ*, which have the property of storing nitrogen from the atmosphere at their roots by the aid of nodules.

6. *Psorolia corilifolia.*—This weed grows in abundance on the waste lands of the Farm. It was observed that this plant being a papilionaceous weed, possessed the property of storing nitrogen like san hemp, and hence it has been selected for the purpose of green manuring. These plants are raised and ploughed just in the same fashion as described above for hemp.

7. *Ashes of Cattle-dung.*—C-dungattle is collected and made into cakes which, when dry, are burnt and reduced to ashes; 3,080 lbs. are applied per acre.

8. *Ambari* (Hibiscus cannabinus) *ploughed in green.*—The seed of this plant is broadcasted at the beginning of the rains at the rate of 50 lbs. per acre. On the 15th of August they are uprooted by hand and are buried in the furrows made by the Swedish plough. The plant Ambari belongs to one of the order *malvaceæ*, which do not possess the property of storing nitrogen from the atmosphere at their roots by the aid of nodules like the sub-division *papilionacæ*.

Experiments with different manures.

Ten experiments were instituted to test the comparative value of different manures or different methods of manuring. Perhaps the most important are those which are conducted on the two series of plots called A and B, in which wheat is annually manured with different materials, the only difference in the treatment being that the A series is unirrigated whilst the B series receives artificial irrigation. Series A was started twelve years ago, series B six years ago.

In fields Nos. 18 and 32 the effect of manuring wheat with a green crop plcughed into the land in August is compared with the outturn of land manured with cattle-dung. The effect also on the wheat crop of saltpetre is tested in field No. 68. In field No. 37, wheat is manured with cattle-dung, which is put on the land at different periods, two plots being manured in June and the other in August.

A series of plots are manured on the system devised by Mr. G. Ville, but the crop sown this year was linseed, instead of wheat as in pervious years.

In fields Nos. 40 and 55 the effect of manuring wheat with a green crop (having the property of storing nitrogen) ploughed into the land in August is compared with the outturn of land manured with a crop ploughed in green but which has not the property of storing nitrogen from the atmosphere.

Lastly, a new experiment has been started in a series of plots lettered C. The object is to test the effect of some ordinary manures on a linseed crop.

The results obtained in the case of each of these experiments during the year under report are tabulated in the following statements together with those of previous years, and such remarks as are deemed necessary are added in each case.

SERIES A. SUBJECT.—*Effect on wheat grown continuously of different kinds of manures applied year after year without irrigation.*

Plot 1. Area 0·10 acre. Manured with saltpetre, 240 lbs. per acre.
„ 2. „ 0 10 „ „ bone-dust, 360 lbs. per acre.
„ 3. „ 0 10 „ „ saltpetre 240 lbs. and bone-dust 360 lbs. per acre.
„ 4. „ 0·10 „ „ dung 160 maunds per acre.
„ 5. „ 0 10 „ „ dung, 160 maunds per acre.
„ 6. „ 0·10 „ „ ashes of dung 160 maunds per acre.
„ 7. „ 0·10 „ Unmanured.
„ 8. „ 0·10 „ Green manured with san hemp.
Commenced in 1884-85. Unirrigated. Crop, wheat (haura), Nagpur.

No. of plot.	OUTTURN PER ACRE.							Cost of cultivation per acre.	Cost of manure per acre.	Gain in value on plot No. 7.
	Average of five years 1885-89.		Average of preceding five years, 1890-94.		1895-96.					
	Grain	Straw.	Grain.	Straw.	Grain.	Straw.	Value.			
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I ...	1,133	1,711	751	1,468	836	1,006	32 15 1	9 10 2	20 0 0	24 7 7
II ...	891	1,388	534	882	486	654	19 6 5	9 4 4	3 6 0	10 14 11
III ...	1,094	1,751	865	1,538	621	709	24 5 3	8 13 8	23 6 0	15 13 9
IV ...	913	1,520	627	1,393	532	678	21 1 8	8 15 4	11 12 4	12 10 2
V ...	953	1,415	666	1,224	632	729	24 12 7	9 6 10	15 8 2	16 5 1
VI ...	949	1,598	576	1,125	621	691	24 4 3	9 6 0	11 9 0	15 12 9
VII ...	799	1,297	418	796	209	316	8 7 6	8 3 8	...	...
VIII ...	705	1,137	584	1,115	236	311	9 6 5	7 11 4	8 4 6	0 14 11

Wheat was sown on the 15th of October and was reaped on the 15th of February. As remarked in my report for last year, the manures in this series rarely produce their full effect on the crop owing to the absence of the cold weather rains. This was especially the case this year owing to the abnormal drought of the season. The hemp which was ploughed in to plot No. 8 appears to have remained altogether unassimilated. These facts are brought out this year by comparing the outturns of this series with those of the B series which received irrigation. Unirrigated crops passed through a trying time this year owing to the signal want of moisture and the grass which grew on the boundaries of the plots absorbed the moisture from the fields to such an extent that hardly any plants grew within three feet of the margin of the fields. The yield of all the plots fell short of the average. The plot manured with saltpetre gave the largest outturn. The small quantity of straw which the plants produced testifies to their stunted condition. The grain which was produced was however very plump.

SERIES B. SUBJECT.—*Effect on wheat grown continuously of different kinds of manures applied year after year with irrigation:—*

Plot 1. Area 0·10. Acre Manured with Saltpetre 240 lbs. per acre.
„ 2. „ 0·10 „ „ Bone-dust 360 „ „
„ 3. „ 0·10 „ „ Saltpetre 240 „ and bone-dust 360 lbs. per acre.
„ 4. „ 0·10 „ „ Dung 160 maunds per acre.
„ 5. „ 0·10 „ „ „ „ and bone-dust 360 lbs. per acre.
„ 6. „ 0·10 „ „ Ashes of 160 maunds dung per acre.
„ 7. „ 0·10 „ Unmanured.
„ 8. „ 0·10 „ Green manuring with san hemp.
Commenced in 1890-91. Irrigated once from the 1st to the 5th December 1895. Crop, wheat (haura)—Nagpur.

No. of plot.	OUTTURN PER ACRE.					Cost of cultivation per acre.	Cost of manure per acre.	COST OF IRRIGATION.		Gain in value on plot No. 7
	AVERAGE OF PRECEDING FIVE YEARS 1890-91 TO 1894-95.		1895-96.					Labour.	Assumed water rate per acre watering.	
	Grain.	Straw.	Grain.	Straw.	Value.					
	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	931	1,789	1,188	1,537	47 3 3	10 11 8	20 0 0	0 13 4	2 0 0	26 8 8
II	626	954	765	835	29 13 4	10 4 2	3 6 0	0 13 4	2 0 0	9 2 9
III	1,012	1,924	1,145	2,005	47 6 7	10 10 0	23 6 0	0 7 6	2 0 0	26 12 0
IV	717	1,217	1,050	1,320	41 9 4	10 10 10	13 7 10	0 7 6	2 0 0	20 14 9
V	739	1,343	1,294	1,706	51 8 7	11 14 0	15 14 10	1 0 8	2 0 0	30 14 0
VI	584	915	754	1,074	30 5 2	10 9 2	11 6 6	0 9 2	2 0 0	9 10 7
VII	486	820	517	702	20 10 7	10 4 2	...	0 11 8	2 0 0	...
VIII	564	1,090	580	730	22 15 7	12 13 0	9 1 10	0 7 6	2 0 0	2 5 0

Wheat was sown in these plots on the same day on which it was sown in the plots of the A series. The land was irrigated on the 1st December. The outturn of all the plots exceeds the average. The grain harvested was plumper than that of the A series. In this series 88 grains weighed a dram while 90 grains of A series gave the same weight. The effect of irrigation is perceptible by comparing the results of the manured plots of this series with the manured plots of the A series.

Irrigation alone has more than doubled the outturn of the manured plots. The application of dung and bone-dust manures which can be had at a trifling cost by any cultivators have shown the best results of all—*vide* plot No. 5. This plot has done better than plots Nos. I and III which were manured with saltpetre. It has been argued in past years that phosphatic manures alone do not increase the yield of the wheat crop on the Farm. A

combination of phosphatic and nitrogenous manures would however appear to work well, and be that the former do not show any result in the first few years but take time to dissolve and become available as plant food.

Hemp had apparently but a small effect this year on the wheat grown in this series. The fact is that owing to the drought it failed to rot properly. This defect was not rectified by the one watering given in December.

FIELD NO. 18. SUBJECT.—*Relative effect of green-manuring, box-dung and stall-dung on wheat grown continuously.*

Plot 1.—Area 0·25 acre. Green-manured with Bawachi (*Psorolia corilifolia*) every year.
„ 2. „ 0·25 „ Unmanured.
„ 3. „ 0·25 „ Manured with box-dung @ 240 maunds per acre.
„ 4. „ 0·25 „ Manured with stall-dung @ 160 maunds per acre.
Commenced in 1890-91. Unirrigated. Crop, wheat (haura) Nagpur.

No. of plot.	OUTTURN PER ACRE.					Cost of cultivation per acre.	Cost of manure per acre.	Gain in value on plot 2.
	Average of preceding five years 1890-91 to 1894-95		1895-96.					
	Grain.	Straw.	Grain.	Straw.	Value.			
	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	594	878	276	433	11 3 11	8 8 8	9 2 4	—7 4 4
II	473	727	462	640	18 8 3	9 11 8	.....	.....
III	657	1,179	755	1,036	30 3 6	10 1 0	12 14 4	+11 11 3
IV	624	878	798	1,161	32 2 11	12 14 4	11 15 4	+13 10 8

Plot No. 1 was sown with the seed of *Psorolia corilifolia*, a papilionaceous weed which grows all over the Farm. Every year the seeds are collected and sown immediately after the monsoon sets in. I noticed however that the seeds which are sown at this time do not germinate as well as those which grow spontaneously on the borders of the fields. I therefore had the seed of this weed sown on the 15th of May. The seed germinated well and the whole of the plot was covered with the plants. The plants were buried in the field on the 12th of August. Plots Nos. 3 and 4 were manured with box-dung and stall-dung respectively on the 31st of May. Wheat was sown at the usual rate on the 12th of October in all the plots. The seed germinated well. As already mentioned in my remarks regarding the plots of the A series, the grass growing on the borders of the plots absorbed the moisture of the fields to such an extent, that hardly any plants kept alive within three feet of the margin of the fields. The green-soiled plot (No. 1) gave the poorest outturn and very much below the average. I think the reason for the very poor outturn is that the plants which were buried in the plot did not decay, as there was insufficient rain after the plot was green-manured and the monsoon gave over altogether at the end of August. The loosening of the seed-bed by green-manuring caused therefore positive harm this season. Wheat likes a firm bed, and this is only attained under circumstances when the rainfall subsequent to the operation of green-manuring is heavy. Plots Nos. 3 and 4 are of even surface; but certain parts of plot No. 3 did not retain the moisture and consequently the germination was uneven. This accounts for the smaller yield of the plot.

FIELD NO. 32. SUBJECT.—*Effect on wheat of green-manuring with cut papilionaceous weeds, Bawachi (Psorolia corilifolia) collected from waste land.*

Plot 1.—Area 0·16 acre. Annually green-manured with Bawachi.
„ 2. „ 0·16 „ Unmanured.
Commenced in 1891-92. Unirrigated. Crop, wheat (haura) Nagpur.

No. of plot.	OUTTURN PER ACRE.											Cost of cultivation per acre.	Cost of green manuring.	Gain in value on plot 2.
	1891-92.		1892-93.		1893-94.		1894-95.		1895-96.					
	Gram.	Straw.	Gram.	Straw.	Gram.	Straw.	Gram.	Straw.	Gram.	Straw.	Value.			
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	570	917	1,136	1,833	787	1,356	528	1,516	773	1,103	31 1 6	11 1 7	6 5 0	5 12 0
II	483	767	714	923	462	850	466	1578	632	880	25 5 6	10 0 5	...	...

In this field the seed of *Psorolia corilifolia* was not sown as in the case of plot No. 1, field No. 18; but was uprooted from the waste lands and carted to the field. During the year under report the weeds were buried on the 19th of August at the rate of 83 maunds per acre. Wheat was sown in both the plots on the 13th of October.

The site of this experiment is low lying, and holds water till late in the year. Hence decomposition of the *Psorolia* was effective.

It will be observed that the results of this experiment are singularly consistent. Each year the green-manured plot has yielded in substantial excess of the unmanured. This year the measure of the profit was Rs. 5-12-0 per acre.

FIELD NO. 68. SUBJECT.—*Effect on irrigated wheat of manuring with saltpetre at different rates per acre.*

Plot 1.—Area 0·10 acre. Unmanured.
„ 2. „ 0·10 „ Manured with saltpetre @ 240 lbs per acre drilled in with seed.
„ 3. „ 0·10 „ Manured with saltpetre @ 80 lbs per acre drilled in with seed.
Commenced in 1890-91. Once irrigated on 8th and 9th December 1895. Crop, wheat (haura) Nagpur.

No. of plot.	OUTTURN PER ACRE.					Cost of cultivation per acre	Cost of manure per acre.	COST OF IRRIGATION.		Gain in value on plot No. 1.
	AVERAGE OF PRECEDING FIVE YEARS 1890-91 TO 1894-95.		1895-96.					Labour.	Assumed water-rate per acre of watering.	
	Grain.	Straw.	Grain.	Straw.	Value.					
	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	558	1,133	1,264	1,666	50 5 5	11 3 2	...	1 14 0	2 0 0	...
II	937	1,848	1,269	1,347	49 5 7	10 15 0	20 0 0	0 15 10	2 0 0	—0 15 10
III	540	919	932	1,127	36 11 11	10 8 4	6 10 8	0 15 10	2 0 0	—13 9 6

The results of this experiment are quite misleading. This year also the unmanured plot (No. 1) gave an outturn equal to plot (No. 2) which was manured with saltpetre at the rate of 240 lbs. per acre. Plot No. 3 which was manured with saltpetre at the rate of 80 lbs. per acre gave the smallest outturn. My opinion is, as stated in last year's report, that this may be due to the natural inferiority of the soil of this plot. Dr. Leather at his inspection of the Farm in March last recommended a new treatment (*vide* paragraph 4 of his note appended, annexure E).

A change will be made in the conduct of this experiment during the coming season, and the effect of applying saltpetre at an earlier period of growth than in the past will be tested.

FIELD NO. 37. SUBJECT.—*The effect of manuring wheat at different times of the year, i. e., June and August.*

Treatment of both the fields is the same.
Crop, wheat (haura) Nagpur.

No. of field.	Sub-plot.	Area.	Treatment in year under report.	OUTTURN PER ACRE.			Cost of cultivation per acre.	Cost of manure per acre.	Gain in value on plot No. 2.
				Grain.	Straw.	Value.			
				lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
37	1	0·33	Manured with 160 maunds dung per acre in August 1895.	404	573	16 3 10	10 8 11	12 2 11	+1 1 7
	2	0·33	Do. in June 1895.	369	607	15 2 8	8 14 2	12 6 3	...
	3	0·33	Do. in August 1895	445	669	18 0 4	7 14 6	11 14 8	+2 14 1

The above experiment was conducted in field No. 37. The results may be compared with those obtained in fields Nos. 15 and 22 last year.

The usual practice among cultivators is to manure their fields in June. Having observed that the heavy rainfall of the monsoon washes away the soluble particles of the manure into the drains, I devised an experiment of manuring one set of plots as usual in June; while I postponed manuring the corresponding plots till August. The manure was weighed for all the plots in June, and in plot No. 2 of field No. 37 it was spread on the 2nd June, and the field was bakhared the same day. On the same day the manure was carted in heaps on high ground in plots Nos. 1 and 2 of field No. 37. To protect the manure from the rain, the heaps were covered over with a layer of dry grass one inch thick, over which was spread a layer of earth about the same thickness. These heaps were spread over the plots on the 2nd of September and at once bakhared. Wheat was sown in all the three plots on the 14th of October. Plots Nos. 1 and 3, which were manured in August, gave an increase in produce of 35 and 76 lbs. respectively over plot No. 2, which

was manured in June. This is only the second year of the experiment, and though no definite conclusion can be drawn as yet, the experience gained this year corroborates that obtained last year. The experiment will be repeated next year.

VILLE SERIES. SUBJECT.—*Practical method of soil analysis by using chemical manures, as devised by Mr. George Ville.*

Plot 1.—Area 0·05 acre. Manured with Ammonic chloride @ 140 lbs per acre.
" Calcic superphosphate @ 180 lbs per acre.
" Potassic sulphate @ 90 lbs per acre.
" Calcic sulphate @ 100 lbs per acre.
" 2. " 0·05 " " As above less calcic superphosphate.
" 3. " 0·05 " " As in plot No. 1, less ammonic chloride.
" 4. " 0·05 " " No manure.
" 5. " 0·05 " " As in plot No. 1, less potassic sulphate.
" 6. " 0·05 " " As in plot No. 1, less calcic sulphate.
Commenced in 1895-96. Unirrigated. Crop, linseed (chaval-katha).

No. of plot.	Average Outturn of Wheat in preceding five years.		Outturn of Linseed per Acre in 1895-96.		
	Grain.	Straw.	Seed.	Stalks.	Value.
	lbs.	lbs.	lbs.	lbs.	Rs. a. p.
I	917	2,002	160	360	9 13 0
II	953	2,044	180	390	11 0 8
III	503	1,054	197	372	11 14 7
IV	492	1,006	155	355	9 9 7
V	955	1,969	172	336	10 6 11
VI	888	1,867	160	303	9 12 3

We have in past years tested the effect of various chemical manures on wheat, and for facility of reference the results obtained are repeated. In accordance with the suggestions of the Agricultural Chemist to the Government of India, it was decided to experiment similarly on linseed in another field. Linseed was sown on the 30th of September in all the plots. The manures were drilled in with the seed. The results obtained during the past five years show clearly that in the case of wheat the outturn is increased by the application of nitrogenous manures irrespective of the importance of other substances; while the figures of this year tend to indicate that linseed is not so much in want of this class of manure (see outturn of plot No. 3 from which ammonic chloride was excluded). It has occurred to me whether this oil-seed could not be more benefited by phosphatic manures. The experiment is an interesting one and will be carefully watched.

FIELDS NOS. 40 AND 55. SUBJECT.—*The effect of nitrogenous and non-nitrogenous crops buried green in soils on wheat.*

Treatment of both the fields is the same. Crop, wheat (haura) Nagpur.

No. of field.	Sub-plot.	Area.	Treatment in year under report.	Outturn per Acre.			Cost of cultivation per acre.	Cost of manure per acre.
				Grain.	Straw.	Value.		
		Acres.		lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
40	1	0·12	San hemp ploughed in green ...	532	893	21 14 3	8 13 8	8 15 9
	2	0·12	Ambadi ploughed in green ...	594	922	24 2 8	9 2 6	8 2 6
55	1	0·27	San hemp ploughed in green ...	302	512	12 7 0	7 7 9	7 12 5
	2	0·27	Ambadi ploughed in green ...	299	421	12 0 1	7 4 1	7 3 9

This experiment was devised by me last year in order to see the effect which a nitrogenous (san hemp) and a non-nitrogenous (*ambari*) crop buried in the fields had each on the wheat crop. The seeds of both these plants were sown on 19th of June and the crop was ploughed in on 11th and 12th of August, respectively. The *ambari* plant is of a very

slow growth. By the time the san hemp plants had grown four feet high, these plants were hardly two feet. The yield in the two portions of field No. 55 was practically the same. But in plot No 2 of field No. 40, which was manured with *ambari*, the outturn was larger than the outturn of plot No. 1 which was manured with san hemp. This result was not anticipated. It should however be stated that none of the green-manured plots (except field No. 32) have done well in this year of deficient rainfall. This being the first year of the experiment no definite conclusions can be drawn. The experiment will be repeated next year.

SERIES C. SUBJECT.—*Effect on linseed grown continuously of different kinds of manures applied year after year.*

Plot 1.—Area. 0·10 acre. Manured with Saltpetre, @ 210 lbs per acre.
„ 2. „ 0·10 „ „ Bone-dust, @ 360 lbs per acre.
„ 3. „ 0·10 „ „ Tarota (*Cassia tora*) to be ploughed in green.
„ 4. „ 0·10 „ „ Dung, @ 160 maunds per acre.
„ 5. „ 0·10 „ „ Bawachi (*Psorolia corilifolia*) to be ploughed in green.
„ 6. „ 0·10 „ „ Ashes of 160 maunds dung.
„ 7. „ 0·10 „ „ Unmanured.
„ 8. „ 0·10 „ „ Green-manuring with san hemp (*Crotolaria juncea.*)

Commenced in 1895-96. Crop, linseed (chaval-kathe.)

No. of plot.	Outturn per acre.			Cost of cultivation per acre.	Cost of manure per acre.	Gain in value on plot No. 7.
	Seed.	Stalks.	Value.			
	lbs.	lbs.	Rs. a. p.	Rs.	Rs.	Rs.
I	441	589	25 14 5	8 10 4	20 0 0	—0 8 3
II	521	739	30 11 9	10 1 8	3 6 0	+4 5 2
III	571	819	33 11 6	9 7 8	20 15 10	+7 4 11
IV	500	780	29 11 6	9 5 2	12 8 10	+3 4 11
V	492	734	29 2 2	9 5 2	3 11 2	+2 11 7
VI	531	875	31 11 4	10 0 0	11 7 4	+5 4 9
VII	445	682	26 6 7	8 13 8	.....	.....
VIII	365	575	21 11 5	8 2 0	8 2 0	—4 11 2

At the suggestion made by Dr. Leather, in his note attached to the Farm report for 1893-94, this series was started. The only difference between this and the Ville Series is that we are here using natural instead of chemical manures. The field in which the experiment is conducted is a good one, and it has not been under linseed for many years. The seed germinated well and a bumper crop was obtained throughout the series.

Amongst the 3 plots which were green-manured with *Cassia tora*, *Psorolia* and *Crotolaria juncea*, respectively, the one manured with *Cassia tora* gave the largest outturn. This plant does not form nodules at its roots as the other two. The plot manured with saltpetre takes a low place, and its outturn is even less than the unmanured plot. It is a matter worthy of investigation how far linseed is benefited by nitrogen. In the Ville Series also the plot from which nitrogen was excluded gave the largest outturn. Plot No. 6, which was manured with ashes of dung, stands second, possibly because ashes do not possess as much nitrogen as dung; while plot No. 4, manured with dung, stands fourth. Plot No. 2, which was manured with bone-dust, stands third, *i. e.*, above the plot manured with dung. But the experiment is still in its infancy and the time has not yet arrived for formulating conclusions.

IV.—ROTATION EXPERIMENTS WITHOUT MANURES.

Rotation.

6. These experiments are conducted in three different fields. Their object is to test the native practices observed by the cultivators of these Provinces and to see whether there is any practical possibility of improving on them. In field No. 29 wheat is followed by gram, juari, &c., or a fallow. In field No. 57 linseed is followed by cotton and others crops. In field No. 61 cotton-tur is followed by wheat and gram. The most important of these experiments are those conducted in fields Nos. 29 and 57. Experiments in fields Nos. 29 and 57 were started five years ago; while the experiment in field No. 61 began in 1893-94.

The results which have been obtained in the case of each of these plots are tabulated below and are compared with those of previous years :—

FIELD NO. 29. SUBJECT.—*Effect of rotation with wheat.*

Plot 1.—Area 0·13 acre. Wheat every year
„ 2. „ 0·13 „ Wheat and fallow alternately.
„ 3. „ 0·13 „ Wheat and gram alternately.
„ 4. „ 0·13 „ Wheat and juar and tur alternately.
„ 5. „ 0·13 „ Wheat and kodon alternately.

Commenced in 1890-91. Unmanured and unirrigated. For cropping, see column 2 below.

No. of plot.	Crop.	OUTTURN PER ACRE.					Cost of cultivation per acre.	Total outlay in cultivation per acre since commencement of experiment (6 years).	Total value of produce per acre since commencement of experiment (6 years).	Total profit per acre since commencement of experiment (6 years).
		Average of preceding five years 1890-91 to 1894-95.		1895-96.						
		Grain.	Straw.	Grain.	Straw.	Value.				
		Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	Wheat ...	578	930	855	1,031	33 11 3	8 2 9	51 2 8	143 15 5	92 12 9
II	Wheat ...	638	1,338	...	...	.....	2 11 7	31 15 2	75 11 2	43 12 0
	Fallow ...	...	...	...	...	.....				
III	Wheat ...	508	1,225	...	...	.....	7 8 4	49 2 8	116 5 5	67 2 9
	Gram ...	444	840	508	840	19 9 1				
IV	Wheat ...	654	1,320	...	...	.....	8 11 1	55 9 4	180 4 4	124 11 0
	Juar ...	164	2,228	579	2,663	52 3 5				
	Tur ...	259	741	566	853					
V	Wheat ...	726	1,402	...	...	.....	5 9 1	50 0 7	96 15 10	46 15 3
	Kodon ...	399	638	549	628	20 4 3				

* Exclusive of cost of watching juar.

Wheat was sown in plot No. 1 on the 13th of October. Plot No. 2 was left fallow in accordance with the due conduct of the experiments. Plot No. 3 was sown with gram on the 22nd of September. In plot No. 4 juar and tur were sown on the 29th June in the proportion of 6 lines of juar to 2 of tur. In plot No. 5 kodon was sown on the 29th of June.

Under the approved rotation the only plot under wheat this year was No. 1. The experiment must be continued for some years longer before any conclusions can be drawn.

FIELD NO. 57. SUBJECT.—*Rotations with linseed.*

Plot 1.—Area 0·28 acre. Linseed every year.
„ 2. „ 0·28 „ Linseed and gram alternately.
„ 3. „ 0·28 „ Linseed and cotton alternately.
„ 4. „ 0·28 „ Linseed and tur alternately.

Commenced in 1890-91. Unmanured and unirrigated. For cropping, see column 2 below.

No. of plot.	Crop.	OUTTURN PER ACRE.					Cost of cultivation per acre.	Total outlay in cultivation since commencement of experiment (6 years).	Total value of produce per acre since commencement of experiment (6 years).
		Average of preceding five years 1890-91 to 1894-95.		1895-96.					
		Grain or lint.	Straw or seed.	Grain or lint.	Straw or seed.	Value.			
		Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	Linseed ...	40	118	19	57	1 3 5	3 3 9 *	31 10 9	11 9 3
II	Linseed ...	41	98	...	...	.....	5 13 2 *	39 3 11	35 9 3
	Gram ...	278	416	273	413	10 6 4			
III	Linseed ...	35	115	...	...	.....	7 10 4 *	39 15 10	45 9 8
	Cotton ...	33	87	100	203	21 1 5			
IV	Linseed ...	46	143	...	...	.....	6 4 0 *	43 6 4	72 8 4
	Tur ...	617	1,650	783	1,918	28 8 10			

* Exclusive of cost of ploughing in hot weather.

The average outturn of the past five years of plot No. 1, in which linseed is sown every year, is 40 lbs. Although the present year was not a bad one for linseed, yet the outturn of the plot is only 19 lbs., which proves that linseed should not be sown year after year in the same field.

The rotation of linseed and tur in plot No. 4, though remunerative on the whole, gives a slightly better average outturn of linseed than plot No. 1. If plot No. 4 were cropped every year with tur only, it would have been far more remunerative. The average outturn of linseed in plot No. 2, in which linseed is rotated with gram, stands second, and plot No. 3 stands fourth in point of the outturn of linseed. The allegations of cultivators that

linseed is a most exhausting crop, and that it should not be sown in any given field more than once in five or six years, have hitherto been borne out by this experiment; and as yet no rotation has been discovered which enables linseed to be grown on the Farm more frequently with satisfactory results.

FIELD NO. 61. SUBJECT.—*Rotations with cotton and tur.*

Plot 1—Area 0·30 acre. Cotton-tur year after year.
„ 2. „ 0·30 „ Cotton-tur in rotation with wheat.
„ 3. „ 0·30 „ Cotton-tur in rotation with gram.
Commenced in 1893-94. Unmanured and unirrigated. For cropping, see column 8 below.

No. of plot.	OUTTURN PER ACRE.											Cost of cultivation per acre.
	1893-94.			1894-95.			1895-96.					
	Crop.	Grain or lint.	Straw or seed.	Crop.	Grain or lint.	Straw or seed.	Crop.	Grain or lint.	Straw or seed.	Value.		
		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.	Rs. a. p.		Rs. a. p.
I	Cotton and Tur ...	21	41	Cotton and Tur	12	31	Cotton and Tur	54	109	21 0 5		11 9 6
		590	1,943		404	832		307	423			
II	Cotton and Tur ...	27	52	Wheat	663	1,010	Cotton and Tur	72	142	33 0 3		10 12 6
		613	1,930					532	768			
III	Cotton and Tur ...	33	51	Gram	523	837	Cotton and Tur	59	120	23 14 3		10 7 9
		630	1,980					352	567			

This is only the third year of the experiment conducted in this field, and though no definite conclusions can be drawn at present, still it may be remarked that in plot No. 2, where cotton and tur are grown in rotation with wheat, the outturn of cotton and tur exceeds that of plot No. 1, in which cotton and tur are grown *year after year*, and plot No. 3, in which cotton and tur are grown in rotation with gram. The outturn of plot No. 3, where gram is sown in alternate years, is not so good as that of plot No. 2, in which wheat takes the place of gram.

V.—ROTATION EXPERIMENTS WITH MANURES.

Rotation with manures.

7. There are six fields in which experiments in manure and rotation are tried.

In fields Nos. 14 and 17 the experiment is designed to bring out the advantage of green-soiling on a rotation of wheat and cotton. In the other fields the effect of the various manures—stall-dung, box-dung, bone-dust and lime, was tested on the following crops grown in rotation:—

Juar and linseed.
Cotton and wheat.
Linseed and cotton.

The results which have been obtained this year in the case of each of these experiments are contrasted below with those of previous years.

FIELD NO. 14. SUBJECT.—*Effect of green-manuring with sanhemp (crotolaria juncea) on wheat with fallow interposed, and on wheat in rotation with cotton.*

Plot 1.—Area 0·18 acre. Green manuring followed by fallow and then by wheat.
„ 2. „ 0·18 „ As above, but unmanured.
„ 3. „ 0·18 „ Green manuring followed by wheat and then by cotton.
„ 4. „ 0·21 „ As above, but unmanured.
Commenced in 1891-92. Plots Nos. 1 and 3 were green-soiled during the year under report. For cropping see column 2 below.

No. of plot.	Crop.	OUTTURN PER ACRE.												TOTAL FROM COMMENCEMENT OF EXPERIMENT (5 YEARS).	
		1891-92.		1892-93.		1893-94.		1894-95.		1895-96.					
		Grain or lint.	Straw or seed.	Grain or lint.	Straw or seed.	Grain or lint.	Straw or seed.	Grain or lint.	Straw or seed.	Grain or lint.	Straw or seed.	Value.	Cost of cultivation.	Cost of cultivation including green manuring.	Value of produce.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	Wheat ...	...	...	911	1,705	...	...	483	683	...	...	...	*7 14 4	58 7 6	53 6 6
II	Do. ...	...	...	829	1,076	...	...	356	372	...	...	...	4 14 3	36 12 3	43 6 6
III	Wheat ...	411	805	...	...	678	1,378	...	...	245	370	9 14 10	*20 12 4	85 10 10	88 6 0
	Cotton ...	...	...	89	225	...	..	26	67	...	...	...			
IV	Wheat ...	371	638	...	...	657	1,419	...	...	399	721	16 5 9	11 14 1	58 9 5	88 9 8
	Cotton ...	...	...	79	207	...	...	21	57	...	...	...			

* Including cost of manuring.

The above experiment is a double one. One pair of plots is fallow in the year of green-manuring, and bears wheat in the following year. The other pair grows wheat after the green-manuring, followed by cotton in the next kharif season. Plot No. 3 was sown with san hemp on the 21st June, and the crop was buried in the plot on the 10th of August.

Wheat was sown in plots Nos. 3 and 4 on the 11th of October. Germination in plot No. 3 was very bad when compared with that of plot No. 4, and is, I think, due to the soil having been very much loosened and by the operation of green-soiling being in consequence unable to retain moisture. Another reason for the stunted growth of the crop was that this plot is full of *Cyperus pertenuis* weeds locally called *Lavi*. Another point noticed by me with respect to the plot was that wheat fails to grow in certain parts of the field. I dug up the ground where this failure occurred, but found that the sub-soil resembled that on which the crop was growing well. Owing to the above mentioned fact this plot cannot be compared with plot No. 4. In 1893-94 when these two plots (Nos. 3 and 4) were similarly cropped, *i. e.*, with wheat, the outturn showed that green-manuring produced no better results when compared with plot No. 4. If the results of 1897-98, in which year wheat will be grown again, are similar, then there would seem no point in continuing the experiment. I am personally in favour of altering at once the site of the experiment.

FIELD NO. 17. SUBJECT.—*Effect on wheat and cotton in rotation on green-manuring with* (bawachi) *a papilionaceous weed (Psoralia corilifolia).*

Plot 1.—Area 0·15 acre. Green-manured with cut weeds every alternate year.
„ 2. „ 0·08 „ No manure.
Both plots cropped with cotton and wheat alternately.
Wheat in the year of green-manuring.
Commenced in 1890-91. Unirrigated. Crop, cotton (jari) in year under report.

No. of plot.	Crop.	OUTTURN PER ACRE.					Cost of cultivation per acre.
		Average of preceding five years, 1890-91 to 1894-95.		1895-96.			
		Grain or lint.	Straw or seed.	Lint.	Seed.	Value.	
		lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.
I	Wheat ...	569	1,246	...	...	...	10 7 9
	Cotton ...	58	141	134	262	28 2 2	
II	Wheat ...	347	816	...	...	...	11 7 4
	Cotton ...	43	112	109	208	22 13 1	

The experiment conducted year after year in plots Nos. 1 and 2 of this field are the same as those conducted in plots Nos. 3 and 4 of the previous experiment (field No. 14). With this difference that the crop ploughed into field No. 14 is san hemp (*crotolaria juncea*), while in field No. 17 the green-manuring is with bawachi (*Psoralia corilifolia*). Cotton was sown on the 28th of June in both the plots. This year being a very favourable year for cotton throughout the district, the outturns of both the plots are more than double the average outturn of the past five years. The green-manured plot No. 1 has increased the outturn of cotton by 23 per cent.

FIELD NO. 42. SUBJECT.—*Relative effect of dung and bone-dust applied each year on juar and linseed grown in rotation.*

Plot 1.—Area 0·27 acre. Manured with dung at 160 maunds per acre.
„ 2. „ 0·27 „ Unmanured.
„ 3. „ 0·27 „ Manured with bone-dust at 360 lbs. per acre.
Commenced in 1890-91. Unirrigated. Crops, linseed (chaval katha) in year under report.

No of plot.	Crop.	OUTTURN PER ACRE.					Cost of cultivation per acre.	Cost of manure per acre.	Gain in value on plot No. 2
		Average of preceding five years, 1890-91 to 1894-95.		1895-96.					
		Grain.	Straw.	Seed.	Stalks.	Value.			
		lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	Juar ...	251	1,902	...	...	...	5 8 3	11 8 8	—1 3 11
	Linseed ...	112	280	71	160	4 6 0			
II	Juar ...	180	1,363	...	...	...	5 0 6	...	...
	Linseed ...	100	199	92	193	5 9 11			
III	Juar ...	184	1,355	...	...	...	6 6 2	3 6 0	—0 4 11
	Linseed ...	108	196	88	164	5 5 0			

Linseed was sown in all the three plots on the 29th of September. The outturns are very poor, and it seems that manures have produced very little beneficial effect. The unmanured plot No. 2 gives the largest outturn. If the outturn given in last year's report be referred to, it will be seen that plot No. 3, which was manured with bone-dust, stood first, while plot No. 1, which was manured with dung, stood last. As observed in a previous part of this report, linseed shows no great liking for nitrogenous manure. But the bone-dust is as yet hardly more successful in this field.

FIELD NO. 44. SUBJECT.—*Relative effect on cotton and wheat in rotation of box-dung, stall-dung and bone-dust.*

Plot 1.—Area 0·27 acre. Manured with stall-dung at 160 maunds per acre.
„ 2. „ 0·27 „ „ box-dung at 240 maunds per acre.
„ 3. „ 0·27 „ Unmanured.
„ 4. „ 0·27 „ Manured with bone-dust at 360 lbs. per acre.
Commenced in 1890-91. Unirrigated. Crop, wheat (baura) in year under report.

No. of plot.	Crop.	OUTTURN PER ACRE.					Cost of cultivation per acre.	Cost of manure per acre.	Gain in value of plot No. 3.
		Average of preceding five years, 1890-91 to 1894-95.		1895-96.					
		Grain or lint.	Straw or seed.	Grain.	Straw.	Value.			
		lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	Cotton ...	44	106	...	...	...	11 11 8	11 3 0	18 3 8
	Wheat ...	515	897	740	1,030	29 10 9			
II	Cotton ...	59	137	...	...	...	11 3 4	12 2 2	23 12 5
	Wheat ...	643	958	868	1,321	35 3 6			
III	Cotton ...	25	53	...	...	...	11 9 2	...	...
	Wheat ...	349	464	279	458	11 7 1			
IV	Cotton ...	24	50	...	...	...	10 9 5	3 6 0	1 5 4
	Wheat ...	284	386	242	448	10 1 9			

Wheat was sown in all the plots on the 14th of October. Plot No. 2, which was manured with box-dung, gives the largest outturn as usual. Plot No. 1, which was manured with stall-dung, comes next. Last year this plot, which was cropped with cotton, gave a better outturn than plot No. 4, which was manured with bone-dust. This year this plot was cropped with wheat, and the outturn is larger than that of plot No. 4. So far as our experiment goes, bone-dust does not improve the yield of either wheat or cotton. Indeed, it seems doubtful whether in some cases it is not harmful by rendering the soil too porous. There is apparently sufficient phosphoric acid in the soil for the purpose of these crops.

FIELD NO. 63. SUBJECT.—*Relative effect on linseed and cotton in rotation of box-dung and stall-dung applied in alternate years only.*

Plot 1.—Area 0·30 acre. Manured with box dung at 240 maunds per acre.
„ 2. „ 0·30 „ Unmanured.
„ 3. „ 0·30 „ Manured with stall-dung at 160 maunds per acre.
Commenced in 1890-91. Unirrigated. Crop, cotton (jari) in year under report.

No. of plot.	Crop.	OUTTURN PER ACRE.					Cost of cultivation per acre.	Cost of manure per acre.	Gain in value on plot No. 2.
		Average of preceding five years, 1890-91 to 1894-95.		1895-96.					
		Grain or lint.	Straw or seed.	Lint.	Seed.	Value.			
		lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p	Rs. a. p.
I	Linseed ...	87	256	...	...	...	15 15 4	7 11 10	17 12 4
	Cotton ...	40	124	165	311	34 7 11			
II	Linseed ...	103	275	...	...	...	12 5 6	...	...
	Cotton ...	31	87	80	151	16 11 7			
III	Linseed ...	128	332	...	...	...	16 7 8	7 9 1	11 14 8
	Cotton ...	38	117	136	273	28 10 3			

Cotton was sown in all the plots on the 27th of June. The cotton crops of the year being exceptionally good, the outturn of plots Nos. 1 and 3, which were manured with box-dung and stall-dung, respectively, is four times in excess of the average. The outturn of the unmanured plot No. 2 is only two and a half times in excess of the average. The cost of cultivation is a little more than the average, and is due to the expenditure incurred in uprooting weeds (*cyperus pertenuis*) which are in abundance in these plots. Box-dung has a marked effect on the cotton and wheat crops. These two crops, it seems, require a large quantity of nitrogen, while linseed does not.

FIELD NO. 65. SUBJECT.—*Effect of liming soils on wheat in rotation with cotton.*

Plot 1.—Area 0·43 acre. Manured with lime in 1890-91 (not to be limed again 1902-03).
„ 2. „ 0·43 „ Not manured with lime.
Commenced in 1890-91. Unirrigated. Both plots are manured with dung in 1893-94. Crop, cotton (jari) in year under report.

No. of plot.	Crop.	OUTTURN PER ACRE.					Remarks.
		AVERAGE OF PRECEDING FIVE YEARS, 1890-91 TO 1894-95.		1895-96.			
		Grain or lint.	Straw or seed.	Lint.	Seed.	Value.	
		lbs.	lbs.	lbs.	lbs.	Rs. a. p.	
I	Wheat ...	557	982	...	...	...	
	Cotton ...	34	92	91	199	19 5 10	
II	Wheat ...	543	1,230	...	...	...	
	Cotton ...	32	82	75	169	16 0 5	

Cotton was sown in the two plots on the 25th of June. The season's outturn of plot No. 1 is more than that of No. 2 which is not limed. The manures applied in 1893-94 were well oxidised in this plot by lime and were made available for the crops. In last year's report it was remarked that in the year of liming, the plot so manured gave the larger outturn of wheat, but since then the unlimed plot (No. 2) has given every year at larger yield than plot No 1 which was limed. But the yield of cotton of the limed plot (No. 1) is not decreasing. I contrast below the outturns of wheat and cotton in both the plots for the past six years :—

No. of plot.	Crop.	OUTTURN PER ACRE.											
		1890-91.		1891-92.		1892-93.		1893-94.		1894-95.		1895-96.	
		Grain.	Straw.	Lint.	Seed.	Grain.	Straw.	Lint.	Seed.	Grain.	Straw.	Lint.	Seed.
I	Wheat ...	647	990	...	...	517	1,124	...	...	507	833	...	...
	Cotton ...	...	...	56	144	...	...	12	40	...	...	91	199
II	Wheat ...	562	1,485	...	...	533	1,195	...	...	533	1,009	...	...
	Cotton ...	...	...	55	134	...	...	9	30	...	...	75	169

Many of the old maxims held by farmers are found to have a foundation of truth; but none more so than that which says—

The use of lime without manure,
Will make the farm and farmer poor.

It has not been the habit to manure this field every year but only occasionally at irregular intervals. I propose to give it a more liberal and regular supply.

VI.—EXPERIMENTS WITH MIXTURES OF CROPS.

Mixtures of crops.

8. These experiments were started with the object of testing the expediency of the practice of cultivators of the Province in growing crop mixtures. Two fields were allotted for conducting these experiments.

The experiment in field No. 25 of mixing gram and wheat, known in the Nerbudda

Valley as *birra*, was commenced in 1890-91; while the experiment of mixing (1) juar and cotton, and (2) cotton and tur, in field No. 55, was begun in 1893-94. The results are given in the tables below:—

FIELD NO. 25. SUBJECT.—*Effect of mixing crops, wheat and a leguminous crop (gram).*

Plot 1.—Area 0·21 acre. Wheat sown alone.
„ 2. „ 0·21 „ Wheat mixed with gram (*cicer arictinum*).
Commenced in 1890-91. Unmanured and unirrigated.
Crop, wheat (Nagpur haura) and gram.

No. of plot.	Crop.	OUTTURN PER ACRE.					Cost of cultivation per acre.
		AVERAGE OF PRECEDING FIVE YEARS, 1890-91 TO 1894-95.		1895-96.			
		Grain.	Straw.	Grain.	Straw.	Value.	
		lbs.	lbs.	lbs.	lbs	Rs. a. p.	Rs. a. p.
I	Wheat ...	420	616	383	478	15 2 6	6 4 5
II	Wheat ...	290	458	263	422	12 14 9	7 3 6
	Gram ...	161	275	53	95		

Wheat was sown on the 12th of October in both the plots. The outturns of gram and wheat in plot No. 2 are moderate. Plot No. 2, lost its moisture very soon and the gram and wheat plants withered in those places where the ground cracked. The outturn of gram is far below the average.

FIELD NO. 55. SUBJECT.—*Effect of mixing crops, the principal one being cotton.*

Plot 3.—Area 0·27 acre. Cotton, jari, alone.
„ 4. „ 0·27 „ Cotton, jari, and tur in the proportion of 6 lines to 2.
„ 5. „ 0·27 „ Cotton, jari, and juar „ „
Commenced in 1895-96. Unmanured.

No. of plot.	Crop.	OUTTURN PER ACRE.			Cost of cultivation per acre.	Gain in value on plot No. 1.
		Grain or lint.	Straw or Seed.	Value.		
		lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
III.	Cotton	107	202	22 6 0	9 6 0	.....
IV.	Cotton	63	125	29 15 1	9 5 1	7 9 1
	Tur	487	966			
V.	Cotton	49	94	25 9 2	*7 9 4	3 3 2
	Juar	218	1,346			

* Excluding cost of watching.

As mentioned in last year's report, this experiment, which was hitherto conducted in field No. 23, has been transferred to field No. 55, the former being quite unsuitable owing to its being water-logged. Plot No. 2, which was sown with cotton and tur, gives the largest profit. Plot No. 3 with cotton and juar comes next, and the plot sown with cotton is the least profitable. Though the year under report was an exceptionally good one for cotton, still the value of the outturn of cotton is not equal either to the value of tur and cotton and juar and cotton of plots Nos. 2 and 3. The admixture of tur and cotton yields large profits. Juar and cotton is a paying mixture, but the juar crop requires watching, the cost of which reduces the cultivator's net profit.

VII.—EXPERIMENTS WITH TILLAGE.

Tillage.

9. Only one of our experiments falls under this head. It was started in 1890-91 in order to test the practice of the cultivators who merely scarify the ground for sowing wheat.

The field is divided into three plots. The first plot is ploughed every year; the second is scarified (bakhared) every year, and the third is ploughed every third year, being hoed during the other two. The results are embodied in the sub-joined table:—

FIELD NO. 21. SUBJECT.—*Effect of tillage to various depths.*

Plot 1.—Area 0·23 acre. Ploughed every year.
„ 2. „ 0·23 „ Bakhared (scarified) every year.
„ 3. „ 0·23 „ Scarified every year and ploughed every third year.
Commenced in 1890-91. Unirrigated and unmanured.
Plot No. 3 was ploughed during the year under report.
Crop, wheat (haura), Nagpur, in year under report.

No. of plot.	Crop.	OUTTURN PER ACRE.					Cost of cultivation per acre.	Gain in value on plot 2.
		AVERAGE OF PRECEDING FIVE YEARS, 1890-91 TO 1894-95.		1895-96.				
		Grain.	Straw.	Grain.	Straw.	Value.		
		lbs.	lbs.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	Rs. a. p.
I	Wheat ...	398	761	340	472	13 10 0	9 2 9	1 3 9
II	Do. ...	503	1,031	306	459	12 6 3	7 9 0	...
III	Do. ...	582	1,073	480	712	19 6 5	8 13 8	7 0 2

Plots Nos. 1 and 3 were ploughed on the 30th of June. Wheat was sown in all the plots on the 11th of October. The outturn of wheat in plot No. 3 is larger than that of the other two plots (1 and 2). The results of this experiment are consistent from year to year, and it would appear that occasional ploughing is advantageous. Plot No. 2 which is only scarified every year has given very poor results. A curious phenomenon was observed by me this year in plot No. 2. The cracks that were produced in this plot were larger and more numerous than those in plots Nos. 1 and 3, and indicates that nature has done the work of ploughing in this plot this year.

VIII.—VARIETY OF CROPS.

Variety of crops.

10. Seven different varieties of cotton, as detailed below, were sown on the Farm during the year:—

(1) Jari } (local varieties)
(2) Bani }
(3) Nimari (obtained from the Khandwa Tahsil in the Nimar District).
(4) Upland Georgian.
(5) Tree cotton (*Gossypium Hirsutum*) } American varieties which were both raised from acclimatized seed.
(6) Borneo cotton, (seed received from Dr. George Watt, Reporter on Economic Products to the Government of India).
(7) Cairo cotton seed, kindly supplied by Mr. J. B. Fuller, C. I. E., who has been on deputation in Egypt.

Three different varieties of wheat were tried, the object being to contrast the yield of the local Haura and Mundia Pissi (a supposed rust-proof variety) with that of Muzaffarnagar Pissi.

A few lbs. of wheat called "Dhana or Jemaria," and said to be rust-proof were received from Mr. E. A. deBrett, I. C. S., Settlement Officer, Saugor.

A few lbs. of Bajra (*Pannisetum Typhoideum*) were sown in order to see whether it thrives well or not in the black cotton soil of the Central Provinces.

Some seed of Jaunpur maize was sown for propagation and distribution, if on trial it proved superior in quality to the variety found in these Provinces.

A small quantity of Jagni seed (*Guizotia Abyssinica*) was sown with a view to ascertain whether it succeeds in black cotton soil or not.

Sorghum seed received from Dr. Leather, Agricultural Chemist to Government of India, was sown for the purpose of comparing its yield as a fodder crop with that of juar.

FIELD NO. 9. SUBJECT.—*To compare the yield of different varieties of cotton—jari, bani, nimari, upland Georgian and tree.*

Treatment.—This field was not manured during the year under report.

No. of field.	Sub-plot.	Area.	Crop.	Outturn per acre in year under report.				No. of field.	Sub-plot.	Crop.	Outturn per acre in 1894-95.		
				Lint.	Seed.	Value.	Gain in value on plot sown with jari.				Lint.	Seed.	Value.
		Acres.		lbs.	lbs.	Rs. a. p.	Rs. a. p.				lbs.	lbs.	Rs. a. p.
9	1	0·27	Cotton, Jari ...	107	222	22 10 0	...	59	2	Cotton, Jari ...	47	110	9 1 2
	2	0·27	„ Bani ...	79	204	22 15 1	0 5 1	...	1	„ Bani ...	27	85	7 9 6
	3	0·27	„ Nimari ...	78	197	22 13 0	0 3 0	...	4	„ Nimari ...	33	99	9 6 3
	4	0·27	„ Upland Georgian..	57	130	15 10 8	—6 15 4	...	3	„ Upland Georgian..	25	65	6 13 0
	5	0·27	„ Tree ...	41	81	8 11 9	—13 14 3	...	5	„ Tree ...	29	73	7 11 2

The experiment was tried to ascertain the yield of each of the varieties of jari, bani, nimari, upland Georgian and tree cotton. The outturn of one field in 1894-95 is contrasted alongside, but for other experiments of this nature reference should be made to page 18 of last year's report. In point of yield, jari surpasses all other varieties. Although the outturns of bani and nimari are less than jari, yet the high price put upon the former staples by the Manager of the Empress Mills, Nagpur, counterbalances the loss sustained in produce. The Manager, Empress Mills, Nagpur, does not place a high value on upland Georgian and tree cotton, and their outturn is also poor in comparison with the three varieties mentioned above. I think the seed of these varieties has deteriorated owing to its being sown year after year. The experiments of both years show clearly that the local Jari is the most profitable variety of cotton for the ryot to cultivate, unless he is allowed by the middlemen to obtain the full value of the higher class cottons, which is rarely the case. Samples of each variety of cotton were sent to the Manager, Empress Mills, Nagpur, for opinion and his reply is given below:—

* * * *

The sample marked "jari" is short stapled like the indigenous cotton of the district, but the fibre seems slightly weaker. We value it at Rs. 64 per *boja* of 345 lbs.

"Tree cotton".—Staple slightly longer, but inferior to the jari in strength. Value about Rs. 65.

"Bani".—Staple fine long and silky. This cotton would rank with Hinganghat cotton, valued at Rs. 89.

"Upland Georgian".—Staple not so fine as the preceding bani sample; also it is weak, but the fibre is long. Value Rs. 85.

"Nimari cotton".—This sample compares better with the sample No. 3 bani. The fibre is long, soft and silky, value Rs. 90."

* * *

North Borneo Cotton.—A packet containing 53 seeds of the above variety was received from the Reporter on Economic Products to the Government of India, and I reproduce below an extract paragraph from a letter from C. V. Creagh, Esq., North Borneo, dated the 18th April 1895.

* * * *

"Having heard that the Indian Government is trying experiments in cross-fertilising cotton plants, I send you some seeds from the interior of this State which you may wish to try. The plants from which they were gathered are grown by the Tagas tribe, about 30 miles from the west coast, and are reported by experts to produce staple of superior quality as regards length and strength.

"The climate of Tagas is something similar to that of the interior of Perak, rainfall about 100," temperature from 69 to 90 probably, but very little is known of the country which has but seldom been visited by Europeans."

The seeds were sown by dibbling in a plot far away from fields in which other varieties of cotton were grown, in order that cross-fertilization should not occur. Only five seeds germinated, out of which four plants died after a month, and one plant alone survived. This plant came to perfection, and attained a height of 7 feet and bore many bolls. The plant is a very late variety. This plant only began to bear flowers after two pickings of cotton from the other varieties had been made. There being no rain after October, I was obliged to water this plant. I examined its cotton, and I find that it has a long fibre, but is not as silky as bani and nimari. The bolls are very small, and the seed about half the size of Jari.

The seed obtained will be sown this year in view to the continuation of the experiment.

Cairo Cotton.—A packet of seed was received from J. B. Fuller, Esqr., I. C. S., C. I. E., on deputation under the Egyptian Government. The seed was sown on a small patch of land far away from other varieties of cotton, in order that hybridization might not take place. The plants grew vigorously, and a sample of the cotton was sent to the Manager of the Empress Mills, Nagpur, who states that it is one of the best varieties of cotton, and places a very high price on it. The fibre was about 1½ inch long. The Manager in referring to this variety writes as follows :—

* * * *

"This cotton is far superior even to the best local samples in the lot. The fibre is about 1½ inch long, nearly ⅛ of an inch longer than the best longest staple grown in India. It is fine, silky. The cotton would no doubt fetch over 6½ annas per lb. (Rs. 140 per *boja* of 345 lbs)."

FIELDS NOS. 22 and 23. SUBJECT.—*To test the effect of yield of different varieties of wheat.*

Treatment.—These fields were not manured during the year under report.

No. of Field.	Sub-plot.	Area.	Kind of Wheat.	Outturn Per Acre.			Remarks.
				Grain.	Straw.	Value.	
		Acres.		lbs.	lbs.	Rs. a. p.	
22	1	·28	Wheat (Mundia Pissi) ...	507	675	18 15 2	
	2	·28	Do. (Haura) ...	512	898	21 3 3	
	3	·28	Do. (Mozaffarnagar, ...	426	715	16 7 5	
23	1	·30	Wheat (Mundia Pissi) ...	477	612	17 11 10	
	2	·30	Do. (Haura) ...	603	912	24 7 1	
	3	·30	Do (Mozaffarnagar ...	458	689	17 6 6	

Wheat was sown in all the six plots on the 12th of October. Local haura which was sown in plot No. 2 of fields Nos. 22 and 23 gives the largest yield. The two varieties of pissi are very late varieties, and the dry state of the soil affected them much more than the haura which is an early variety. Haura wheat ripens about 20 days earlier than the pissi wheat. Mundia pissi is reported to be a rust resistant variety, but as there was no rust on the farm this year I was unable to test its merits in this respect.

Dhana or jemariya pissi wheat was received from E. A. deBrett, Esq., I. C. S., Settlement Officer, Saugor, who writes as follows about this variety.—

* * * wheat known here as the Dhana Jemariya Pissi, from its resemblance in shape to the coriander or juari seed. This species of pissi is said to be less liable to rust than others, and the Commissioner wished it to be tried as an experiment in the Government Farm under your management.

The seed was sown in a separate plot of ground. The variety comes to maturity very late, and its rust resistant properties could not be tested in the year under report as there was no rust on the farm. The variety seems to be a hardy one, and its yield is equal to the Local haura. But market value is less by Rs. 2 per *khandi* of 400 lbs.

A few lbs. of bajra (*Pannisetum Typhodeum*) was sown in two fields. It did not thrive well in black cotton soil. It requires light soil possessing natural drainage, and would probably succeed better in Nimar or the plateau districts. The cattle did not manifest the same liking for this fodder as they do for juar (*Sorghum valgare*).

A packet of Jaunpur maize seed was obtained from the Cawnpore Farm. The cobs produced were much larger than the local varieties. Each plant bore from 2 to 3 cobs. The seeds were of a pearly white appearance, while the local varieties are yellowish. The seed was kept in stock for distribution to villages under Court of Wards management.

A small quantity of jagni (*Guizotia Abyssinica*) seed was sown. The plant belongs to the natural order *compositæ* and its seeds are used for extracting oil in the Chhindwara and Betul districts. It cannot be successfully grown in the soil of the Farms, perhaps owing to defective drainage. It requires light sandy soil with an admixture of moorum known as Khardi.

Sorghum Halipense seed was sown in a field along with juar. It is a fodder plant and is grown on the Saharanpur Farm (Military). A description of the plant as given by Dr. Leather is reproduced below :—

* * * *

I have some seed of "Sorghum Halipense," a fodder which they swear by on the Saharanpur Farm (Military), and I write to ask you if you could have it tried at Nagpur. It is very prolific and gives a heavy yield. Here it is a monsoon crop, and they harvest it at the end of the rains, dry it and stack it. It would probably do best with you also in the rains or early autumn. I can't send you more than 20 lbs.

* * * *

The yield was a poor one. Samples of the plant cut in different stages of its growth were sent to Dr. Leather for analysis and his report is reproduced below. A point worth noticing in this plant is that the stump which remained in the ground continued sprouting and tillering all the year round. Even in the hot months of April and May I discovered some green blades about the plant when other grasses were all parched.

Report on the composition of juar (*Sorghum valgare*) and of "cuba grass" (*Sorghum halipense*) grown at the Nagpur Farm, 1895 :—

		Moisture.	Oil.	Albuminoids.	Carbohydrates, &c., starch.	Woody fibre.	Ash.	Total nitrogen.	Albuminoid nitrogen.	Insoluble siliceous matter.	Remarks.
18—96	Cuba grass (reaped green)...	70·96	...	·81	12·14	12·57	3·52	·184	·130	2·2	Composition represents the fodder in the fresh state.
20—96	Do. (reaped ripe) ...	57·15	...	1·22	19·17	18·13	4·33	·260	·196	3·04	
22—96	Do. seed ...	7·84	3·95	7·36	53·47	16·45	10·93	1·35	1·18	8·58	
19—96	Juar (reaped green) ...	69·76	...	·55	14·74	11·90	3·05	·113	0·88	1·88	
21—96	Do. (reaped ripe) ...	67·02	...	·64	16·42	12·78	3·14	·173	·103	1·62	
23—96	Do. seed ...	9·96	3·40	7·66	74·44	2·24	2·30	1·26	1·22	·629	
24—96	Do. Bhusa ...	10·79	...	2·24	51·57	25·42	9·98	·484	·358	6·94	Composition of the Bhusa in the state as received.

The cuba grass contained rather more albuminoids and about the same proportion of carbohydrates, but at the same time also rather more indigestible woody fibre than the juar. It may be considered quite as good as fodder (weight for weight) as juar. The crop weighed much less, but this may be due to either accident or climatic influence, and it will be interesting to see whether a larger yield will be obtained in another year. Its seed is hardy comparable to juar seed, as it was not freed from the chaff, which makes the seed appear to contain a higher proportion of woody fibre than it would have done had it been fairly free from chaff. The juar seed was freed from its chaff.

IX.—EXPERIMENTS WITH PLANT DISEASES.

Rust.

11. The principal plant disease which the cultivators have to combat against in the Central Provinces is wheat rust (a fungus pest).

During the year, in response to a request of Dr. Watt, the subject was examined with a view to furnish such information in regard to rust as was available.

The disease appears to be propagated when there is a large amount of humidity in the air or when the seed-bed is too moist. The accompanying rainfall table from 1887 to 1895 gives colour to the above statement :—

Table showing the Rainfall from the year 1887 *to* 1895.

		Rust on linseed (1887-88).	1888-89.	1889-90.	Rust on linseed and wheat (1890-91.)	1891-92.	Rust on both crops extreme (1892-93.)	Rust on both crops slight (1893-94.)	Rust on linseed, extreme—wheat, slight, (1894-95.)
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
April	1st half	·05	...	...	·04	·27	...	...	·18
	2nd half	...	·06	1·19	·15	.17	·02	·09	...
May	1st half	·33	...	...	...	·30	·01	...	...
	2nd half	·03	...	·06	·64	·03	...	·81	·16
June	1st half	·68	3·95	·56	2·52	...	1·83	4·35	3·45
	2nd half	7·87	5·88	6·54	7·15	01·	4·34	5·49	4·50
July	1st half	5·46	7·95	4·48	9·31	9·13	5·74	5·36	5·95
	2nd half	14·03	3·91	2·59	6·35	10·68	7·72	2·23	7·61
August	1st half	4·94	3·25	9·34	5·06	2·97	2·36	4·86	5·14
	2nd half	5·69	4·55	4·92	6·66	2·62	6·21	10·89	8·36
September	1st half	5·38	2·33	2·60	4·95	7·29	9·19	4·53	10·18
	2nd half	3·26	3·42	3·03	8·97	17·40	2·35	3·51	3·94
October	1st half	4·86	...	1·23	·05	·59	...	4·89	·02
	2nd half	...	·14	2·77	·01	...	3·74	·94	4·13
November	1st half	1·76	·61	...	2·53	...	...	2·96	2·48
	2nd half	...	·74	...	...	...	...	...	...
December	1st half	...	·04	...	·99	...	...	...	...
	2nd half	·13	...	...	1·63	...	·03	...	·18
January	1st half	1·75	...	...	...	...	2·10	·12	...
	2nd half	...	...	...	1·17	...	1·47	...	...
February	1st half	...	...	...	·15	·57	...	...	·05
		8·50	1·53	4·00	6·53	1·16	7·34	8·91	6·86
	2nd half	·33	...	...	·48	...	·63	...	·62
March	1st half	·17	...	·25	·67	...	3·26	...	·31
	2nd half	...	·01	·01	·19	...	...	·16	·40
	Total	56·72	36·84	39·57	59·07	52·01	51·00	51·19	57·66

The total quantity of rainfall has very little to do with the disease, but the rainfall during the period, October to February, has evidently some connection with it. By going over all the farm reports since the establishment of the Experimental Farm, I find that there was no rust from 1887 to 1890. But in 1890-91 linseed and wheat were affected with rust, and that was the beginning of the disease in Nagpur so far as the records show. The greatest havoc was produced by this disease in 1892-93, and since that year rust has visited the Farm almost every year. In those years in which there was no rust the rainfall in the months, October to February, was scanty. The average rainfall of Nagpur from 1887 to 1895 is 54·50 inches.

The experiments that have been conducted at the Farm afford ground for supposing that the disease is not propagated by the existence of rust spores, *i. e.*, uredo spores in the seed. Early sown wheat (*i. e.*, that sown between 10th and 20th October) does not suffer so

much as the late sown. If the plants are affected with disease when they are just in the flowering stage, the crop is a total failure. But if the rust comes on when the plants have passed this stage, they are not so much affected. I have observed that in the evening a few blades of wheat were affected with rust, and in one night the disease has spread to such an extent that the whole plant up to the infloresence was covered over with the spores of rust. The disease goes on spreading from the bottom to the top. All fields are not attacked all at once. Manured fields have hitherto been more severely attacked than the unmanured ones, which I am inclined to attribute to the fact that the uredo spores when blown by the wind have no room to escape from the field in which the plants owing to manure have grown and tillered very thickly, while the spores are more easily blown away from an unmanured field in which the plants have come up very thin. I have also observed that if the crop is washed by heavy rain at a time when the uredo spores are developed and flying about, the disease is checked to a certain extent, and this may be due to the failure of the spores when dashed on the ground to produce a mycelium.

In 1890-91 rust was first seen on the 23rd January, and in 1892-93 it was seen first on the 15th of January. In two weeks' time it assumed an alarming epidemic form. The seed which is sown earlier, *i. e.*, in October, comes to the flowering stage before this time, and thus escapes the attack of rust.

Nagpur haura (hard white) and pissi (soft white) in my experience generally suffer the most; while katha (hard red) is not so much affected as the above.

The season under report has not been favourable to the prosecution of enquiring into the origin and development of this disease because, owing to the excessive drought, no trace of rust has manifested itself.

The first experiment conducted in field No. 15 was to test the effect of sowing wheat mixed with mustard as a preventive or palliative of rust.

In plot No. 1 of field No. 15 wheat was sown in a mixture with mustard, and in plot No. 2 wheat was sown alone. The mustard crop was an entire failure. The plants did not come to perfection. In the absence then of any trace of rust no conclusion could be formed.

The second experiment was designed to verify how far the reputation enjoyed by the species of wheat termed *mundia pissi*, as to being rust proof or rust resistant, was well grounded.

The three varieties of wheat, *viz.*, haura, mundia pissi, and muzaffarnagar, produced a fair outturn, but in the absence of rust the experiment was of course quite inconclusive.

The experiment in the cross fertilisation of wheat with a view to obtain a rust-proof variety was continued. A description of the procedure observed will be found on page 21 of last year's report. It was therein stated that two grains were secured by the combination of katha and pissi. They were sown in a pot. The plants were not very healthy. Three ears were found, out of which I got only 14 grains. The grain has also a dull appearance, and though fairly plump has a shrivelled skin. This does not seem likely to turn out a very satisfactory variety.

From one grain produced in the previous year by the combination of haura and mundia pissi a plant was obtained bearing three ears. The plant was very healthy, tall and robust. The three ears yielded 150 grains. They are glossy, plump and bid fair to fetch a good price in the market. This is the most promising result as yet obtained from my hybridisation operations.

The third combination of mundia and katha produced a plant bearing four ears, from which 92 seeds were secured. The plant was healthy and robust, and the seeds produced are also plump, but they are red and hard, and the species is not calculated to fetch a good price.

The fourth kind was that obtained from a combination of katha and mundia. The plant grew well, tillered freely and produced two ears. But there was not a single grain formed in them. It is a curious phenomenon, and the experiment will be tried again in order to see whether plants obtained from a combination of katha and mundia fail to propagate its species. The fifth variety obtained from the combination of haura and pissi produced 12 grains. The plant was healthy, but bore only one ear. The grain has a dark-red colour, though the father and mother are both of a white variety. This variety then is not altogether promising.

Another experiment made in the matter of plant diseases was to test the effect of sowing gram in a mixture with linseed, which suffers from "*talap*". Linseed affected by this disease withers away rapidly, and in many fields of the Farm linseed suffers in this way.

FIELD NO. 59. SUBJECT.—*To test the effect of gram on linseed dying from talap.*

Plot 1. Area 0·31 acres. Crop Linseed (haura).
„ 2. „ 0·31 „ „ linseed and gram.
„ 3. „ 0·31 „ „ linseed (haura).
„ 4. „ 0·31 „ „ linseed and gram.
„ 5. „ 0·31 „ „ linseed (haura).

No. of plot.	Crop.	OUTTURN PER ACRE.				Remarks.
		Grain.	Straw.	Value.	Cost of cultivation.	
		lbs.	lbs.	Rs. a. p.	Rs. a. p.	
I.	Linseed ...	11	47	0 12 5	7 0 11	
II.	Linseed and gram ...	7 367	38 377	13 15 0	9 6 0	
III.	Linseed ...	17	104	1 4 9	7 0 11	
VI.	Linseed and gram ...	10 334	46 371	13 0 4	10 10 5	
V.	Linseed ...	12	51	0 13 7	5 11 11	

In field No. 59 linseed was sown in a mixture with gram. It is observed that the linseed plants in this field wither after attaining a height of three inches from causes unknown. The presence of gram did not prevent the plants from dying.

Smut (*Ustilago Carbo*).—Another disease which the cultivators of these Provinces have to battle against is "smut" (ver. cajali or kani). But its effects are not so far-reaching as those of rust nor is it so widespread.

Several means of stamping out the disease have been suggested. One is to sprinkle the seed with stall urine of cattle before sowing, the seeds being subsequently raked in powdered quick lime till the seed assumes a white appearance. Another method is to soak the wheat seed for ten minutes in a solution of sulphate of copper. One lb. of blue stone, (sulphate of copper : ver. nilatota or morchuta) dissolved in 5 quarts of boiling water will suffice for a sack containing 240 lbs. of wheat. The latter remedy was tried on the Farm during the year under report. The smutted ears which were found in a field sown with the prepared seed amounted to one per cent. only, while in fields which were sown with unprepared seed, the percentage of smutted ears was as high as 20 per cent.

X.—METHODS OF CULTIVATION.

Methods of cultivation.

12. The experiment noticed in last year's report for preventing the damage caused to rabi crops by trees in their vicinity was repeated this year with similar success.

A plot was sown with sugarcane, and the plants were mulched with dry grass in the hot weather and the plants derived much benefit therefrom as in the past year. The two advantages I am inclined to claim for this practice is that the plants require less irrigation and the labour of weeding is saved.

Two plots were sown with safflower (*Carthamus tinctorius*). From the plants grown in one of the plots the petals of flowers were plucked while the flowers of the other plot were left untouched, the object being to ascertain whether the removal of the flowers caused any reduction of the yield of seed. The petals are called kusum and are used for dyeing cloth. The dye is of a deep orange or dark red colour. The yield of the plot was not in any way affected by the removal of the petals. The yield per acre of both the plots was 307 lbs. and the weight of kusum was 20 lbs. The people of these parts extract oil from the seed of this plant.

There are two varieties of this plant. One possesses stiffer thorns than the other. The process of removing the petals from the thorny species is decidely troublesome.

A plot sown last year with four varieties of cotton was left undisturbed in order to see whether cotton fibre, obtained from the plants which are allowed to remain for more than one season, deteriorates in any way.

FIELD NO. 38.—SUBJECT.—*To test the quality of cotton fibre of plants sown in a previous year and ascertain whether it deteriorates.*

Treatment.—This field was top-dressed with straw used as bedding for cattle.

No. of field	Sub-plot.	Area.	Crop.	OUTTURN PER ACRE IN 1895-96.				OUTTURN PER ACRE IN 1894-95.		
				Lint.	Seed.	Value.	Grain in value on plot sown with jari.	Lint.	Seed.	Value.
		Acres.		lbs.	lbs.	Rs. a. p.	Rs. a. p.	lbs.	lbs.	Rs. a. p.
38	1 N	·05	Cotton Bani ...	27	70	7 9 8	—0 6 10	18	52	4 15 9
	1 S	·05	Do. Jari ...	40	77	8 0 6	...	16	48	3 4 1
	2 N	·05	Do. Nimari ...	32	72	8 5 1	0 4 7	16	44	4 7 10
	2 S	·05	Do. Upland Georgian ...	40	77	7 14 8	—0 1 10	17	36	4 8 1

The cotton plants which were sown in this field in June 1894 were left undisturbed. The yield of all the varieties, though in excess of that harvested last year, is not even a moderate crop for the year under report. The fibre was very weak.

The Manager of the Empress Mills, Nagpur, to whom samples were sent for opinion writes as follows :—

"These samples do not compare favourably with those you sent nearly two months ago. They have lost in colour and strength and have more dirt and broken leaves in them; but are softer to the touch.

Sample of jari cotton compared to that of jari grown this year: the fibre is soft, nearly equal in length but weak. In appearance it has a slightly yellowish tinge, while the former sample is whitish. Value Rs. 61 to Rs. 62 per *boja* of 345 lbs.

Bani.—This has also lost in quality a little compared with the former sample. The staple is as long and strong but it is not so white and has a little dirt and broken leaves in it. Value about Rs. 85.

Nimari.—The former sample is superior to this, as it is whiter in appearance than the present one, is free of dirt and broken leaves. The staple of the latter is also weak and not so long as the former one. Value Rs. 80.

Upland Georgian.—This seems to have suffered the most. We can value it at only Rs. 60 or 61, while the former was valued at Rs. 85. This staple is short and weak, compared with the former sample it has no redeeming point.

XI.—TRIAL OF IMPLEMENTS.

Implements.

14. Another trial was given to the Beehea Thresher received last year from Messrs. Thompson and Mylne. This machine works very slowly, and cannot in any way be compared to the threshing done by bullocks. The cultivators generally have 2 or 3 pairs of bullocks which they can easily employ in threshing without detriment to other operations.

The only other new implement which was tried on the farm was the double action Macarthy cotton gin. The machine cost Rs. 220. It is worked by three persons—two men and a woman. The former turn respectively the fly wheel and crank handle, while the woman feeds the machine. It gins 80 lbs. of seed cotton a day without injury to the staple. The wages of the persons employed to gin this quantity amount to Re. 0-7-6 per diem, compared with Re. 0-12-0, the wages that would have to be paid for the ginning of a similar quantity by the native implement known as Recha.

The other machines mentioned in last year's report were also used and continued to give satisfaction.

I have made a slight improvement in the *tifan* or drill used by the cultivators of the Nagpur country for sowing cotton and tur. The labour of two women is thereby saved. A machine so improved was sent to Mr. Montgomerie, Settlement Officer, Nimar, for practical trial by cultivators of his district.

XII.—DISTRIBUTION OF SEEDS AND IMPLEMENTS.

Maize.

15. Jaunpore maize raised from seed obtained from the Superintendent, Cawnpore Experimental Farm, was distributed during the year to the undermentioned gentlemen:—

(1) Rao Biharilal of Jubbulpore.

(2) Mr. A. Mayne, I. C. S., Settlement Officer, Balaghat.

(3) Mr. Mahomed-ul-Hussen, Superintendent, Land Records, Chhindwara.

(4) The Tahsildar, Lakhnadon.

(5) Mr. Kesho Rao, Manager, Court of Wards, Nagpur.

(6) Rao Bahadur Bapu Rao Ramchandra Patwardhan, Retired Judge, Small Cause Court, Nagpur, who has some villages in the Nagpur District; and other native gentlemen of the city.

(7) Kachis at the Sewage Farm, Nagpur.

Five Swedish ploughs were sold to cultivators of Saugor, Seoni, Kamptee and Wardha.

One Beehea sugarcane crusher was sold to a gentleman at Saoner, and several were given out on rent during the season.

One Bakhar (scarifier) and one seed-drill, as used in the Nagpur country, were sent to the Manager, Nowchandi fair, Meerut. Another seed-drill was sent to the Director of Land Records and Agriculture, Punjab.

XIII.—CATTLE BREEDING.

Cattle breeding.

The two Mysore bulls referred to in paragraph 16 of last year's report have been standing at the Farm up to November 1895.

In that month, in accordance with the wishes of the Administration to improve the local breeds of cattle in Court of Wards Estates, I proceeded to a village, Jaitpore, belonging to Mussamat Laxmibai Naikin, whose property is under the Court of Wards (the village is situated on the borders of Nagpur and Chhindwara districts) and there a herd of cattle, numbering 250 head, is maintained for breeding.

Having inspected this herd, I came to the conclusion that a Mysore bull would be a most suitable animal to improve the stock.

To describe the breed briefly, it is produced by crossing a Gujerat bull with the indigenous cattle of the country, which are white, with black hoofs, their horns are short, and they have a very distinguishing feature in the shape of the forehead, which is very prominent, being distinctly convex (this is especially seen when taken in profile).

The bullocks on account of their being able to trot at a considerable speed are much sought after for drawing tongas and other vehicles; the cows yield a fair supply of milk.

They are brought up in a state of nature, and are grazed in the adjoining forest. The calves are allowed to drink all their mother's milk.

The village stands on a hill, and the cattle are reared on stony ground, which results in the sickly ones dying off and only the strong live and develope into good, hardy animals. Each bull is separated from the herd when he is a year old, and sold by auction, and fetches from 60 to 80 rupees; heifers are never sold. The indigenous breed is called Kamarpani, and is smaller than the Gavalaoo; their horns are long and irregular and the females yield less milk than the above.

The people of Jaitpore have a peculiar fondness for white cattle, and as the colour of the Mysore bull is grey, they objected to him. In other respects, however, they expressed their approval of the animal. He has since been sent to Rahati, a village in the Wardha district, where a small herd is kept for breeding (this village is also under Court of Wards, and belongs to the lady referred to above).

The second Mysore bull which still stands at the Farm is gaining in popularity, and numbers of 'gowlies' and residents of the station send their cows to him.

XIV.—EXPERIMENTS WITH FODDER AND FOREST RESERVE.

Fodder and Forest.

17. The seedlings of Teak (*Tectona grandis*), Babul (*Acacia arabica*), Khair (*Acacia catechu*), Anjan (*Hardwickia binata*), Bijasal (*Pterocarpus marsupium*), Kurroo (*Corchorus trilocularis*), Ber (*Ziziphus vulgaris*), Charoli (*Buchanania latifolia*) are growing slowly but steadily. An area of about 10 acres has been fenced in with prickly pear to protect the seedings from stray cattle, but it will take some time for the plant to form a hedge.

Two chowkidars were employed throughout the year in watching the area. The grass at Telinkheri though not very good of its kind is still liked by the cattle. The different species of grass which grow on the hill are given below:—

Panicum colonium,

Paspalum Scrobiculatum,

Andro pogonia annulatus,

* *Andro pogon truin,*

* *Heteropogan contortus (spear grass),*

Andro pogoneal,

* *Chryso pogan cæruleus,*

Setaria Glanea,

Pennesetum cenchroides,

Aristida depressa,

Panicum crucoforme,

Apluda aristala.

Those marked with an asterisk are growing in abundance.

The Farm and the Garden continue to draw their supply of grass from the reserve. This year also an experiment in the ensilage of the grass was undertaken with similar success to that attained in the previous year.

The receipts and expenditure of the reserve are as follows:—

	Rs.
Pay of 2 chowkidars at Rs. 6 per mensem	144
(1) Value of grass supplied to the Farm	250
(2) Do. do. to the Garden	144
(3) Do. do. disposed of by auction	140
	534
(4) Deduct cost of establishment	144
Net profit Rs. ...	390

At Dr. Leather's suggestion it is now proposed to irrigate the trees in a portion of the reserve for the first 2 or 3 years so as to accelerate the growth of vegetation on these hills. In the other portion the progress of natural reproduction will be watched and the experiments that have been conducted for the past few years in this direction will be continued.

XV.—SEWAGE FARM.

Sewage Farm.

18. There is nothing special to remark on the subject of the Sewage Farm which has been worked on the same lines as have been described in previous reports. In connection with the question of the disposal of sewage, it is noticeable that the shallow system of pitting invented by Conductor Meagher of Allahabad has been tried this year on the Farm and promises well. The great advantage of this method is that no handling of the poudrette is necessary.

XVI.—AGRICULTURAL CLASS.

Agricultural class.

19. The working of the Agricultural Class has been separately reported upon. The year opened with six senior students. Eight new students joined the junior class. Four were scholarship-holders. Four had passed the Middle School and four the Entrance Examination. Practical field work was as usual insisted upon. The senior students cultivated both kharif and rabi crops on the half acre plots allotted to them, and the juniors cultivated only rabi crops on their quarter acre plots. The total area under cultivation was 5 acres, and the students realised Rs. 118-0-8 by the sale of their crops, each one appropriating the value of the produce of his own plot.

The annual examination papers were set by the undermentioned gentlemen:—

Doctor J. W. Leather, Agricultural Chemist to the Government of India—Agriculture.

Rev. Dr. A. Robertson, M. B., Principal, Hislop College—Botany, Geology and Chemistry.

Mr. R. K. Indurkar, Superintendent of Land Records and Agriculture, Nagpur—Surveying.

I examined the students in practical agriculture, such as ploughing, harrowing, &c., and veterinary.

The results were fairly satisfactory, considering that influenza incapacitated four out of eight juniors from attending the examination. Five out of six seniors passed the final examination, and three out of eight juniors were promoted to the second year's course. All the passed students of the class were provided with posts in the Settlement or Forest Department.

In the Normal Agricultural class for village schoolmasters, there were thirty-three masters during the first term, but two left the class before the examination, and during the second term there were thirty-three masters, out of whom one failed in the examination.

XVII.—FINANCIAL RESULTS.

20. The expenditure and receipts of the year are shown below:—

	Expenditure.			Receipts.	Net cost.
	Salaries.	Contingencies.	Total.		
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Budget	4,521 0 0	4,806 0 0	9,330 0 0	2,050 0 0	7,280 0 0
Actual	3,820 7 3	3,558 3 4	7,378 10 7	2,897 8 9	4,481 1 10

Detail of Receipts for 1894-95 and 1895-96.

Heads.	Amount.		Remarks.
	1894-95.	1895-96.	
	Rs. a. p.	Rs. a. p.	
Commercial sale of produc ...	533 9 3	785 6 1	
Distribution. Seeds ...	9 3 0	8 0 0	
Distribution. Implements ...	21 0 0	185 5 9	Increase is due to the sale of ploughs and sugar-cane mills.
Rent of Government land ...	589 15 4	952 13 6	Arrears.
Sewage Farm ...	586 8 3	589 12 11	
Miscellaneous ...	256 10 2	376 2 6	
Total ...	1,996 14 0	2,897 8	

Detail of Expenditure for 1894-95 and 1895-96.

Heads.	Amount.				Remarks.
	1894-95.		1895-96.		
	Rs.	a. p.	Rs.	a. p.	
Purchase of seeds and plants ...	13	6 3	2	13 0	
Repairs of premises ...	* 3,049	7 5	386	1 8	* Sum paid for building.
Postage ...	5	0 0	15	6 0	
Service telegrams ...	1	0 0	...		
Country stationery ...	0	11 6	0	10 6	
Purchase of books ...	...		...		
Do. cattle ...	250	0 0	185	4 0	
Do. implements ...	112	7 0	† 293	13 0	† Purchase of a gin.
Repairs of tools and plant ...	88	5 3	65	0 5	
Feed and care of cattle ...	981	11 2	461	2 5	
Irrigation ...	294	4 11	100	15 9	
Manure ...	31	1 0	40	7 0	
Variable labour, agricultural ...	224	6 6	216	0 7	
Do. earthwork, &c. ...	21	5 9	22	0 0	
Packing and freight ...	102	2 9	82	2 1	
Sewage Farm ...	1,693	11 0	1,352	0 5	
Binding charges ...	1	4 0	1	8 0	
Other miscellaneous charges ...	100	11 6	287	8 6	
Total ...	6,976	0 0	3,512	13 4	
Establishment ...	3,835	8 5	3,820	7 3	
Total ...	3,835	8 5	3,820	7 3	
Travelling allowance of Superintendent ...	23	12 0	45	6 0	
Total ...	23	12 0	45	6 0	
Grand Total ...	10,835	4 5	7,378	10 7	

I have the honour to be,

Sir,

Your most obedient Servant,

R. S. JOSHI,

Superintendent,

overnment Experimental Farm, Nagpur.

LIST OF ANNEXURES.

A.—Statement showing the total areas under cultivation on the Experimental Farm, Nagpur, during 1895-96.

B.—Statement showing the average rates of the cost of cultivation on the Experimental Farm, Nagpur, during 1895-96.

C.—Statement showing the rates used for valuing the produce of the Experimental Farm, Nagpur, during 1895-96.

D.—Programme of experiments as it stood on the 1st June 1896.

E.—Inspection note on the Nagpur Experimental Farm, by Dr. J. W. Leather, Agricultural Chemist to the Government of India.

Annexure A.

Total Area under cultivation on the Experimental Farm, Nagpur, during the year 1895-96.

Crop.	Area.	Total.	Grand Total.
A.—EXPERIMENTAL AREA.	Acres.	Acres.	Acres.
(1) *Kharif*—			
Cotton alone	4·09		
Cotton and tur	1·17		
Cotton and juar	·27		
Juar and tur	·13		
Tur	·28		
Kodon	·13		
Sorghum and Juar	·91		
(2) *Rabi*—		6·98	
Wheat	11·12		
Wheat and gram (berra)	·21		
Gram	·41		
Linseed	3·12		
Linseed and gram	·62		
Sugarcane	·18		
B.—NON-EXPERIMENTAL AREA.		15·66	22·64
(1) *Kharif*—			
Cotton	3·33		
Juar	3·45		
Tur	8·22		
Popat	1·06		
Til	·38		
Bajra	2·44		
San hemp	·16		
Jagnee	·15		
Castor	·81		
(2) *Rabi*—		20·00	
Wheat and gram (berra)	13·33		
Linseed	3·72		
Gram	3·91		
Peas	·28		
Kardi	·89		
Gram and oats	2·21		
Gram and kardi	1·04		
		25·38	45·38
GRAND TOTAL ...	...	...	68·02

Annexure B.

Statement showing the average cost per acre of each operation of cultivation on the Experimental Farm, Nagpur, during the year 1895-96 *as deduced from the Field Cultivation Book.*

[NOTE.—The hire of a pair of bullocks is taken as 12 annas; of a male cooly 3 annas; of a female cooly 1½ anna; and of a child 1 anna]

Class of operation.	Detail.	Rate per acre.	Explanation.
		Rs. A. P.	
Cost of tillage.	Ploughing by Swedish plough ...	1 5 4	A pair of bullocks and a man for 1·42 days.
	Hoeing by bakhar (bullock hoe) ...	0 9 3	Do. do. ·61 day.
	Weed hoeing by daura (small bullock weeding hoe)	0 5 11	Do. and 2 men for ·32 day.
	Do. by dundia (large do.) ...	0 6 3	Do. do. ·34 day.
	Weeding by hand	1 2 9	10 women for 1·25 days.
Cost of sowing, including cost of seed.	Cotton by argarha (country drill hoe) ...	0 10 3	16 lbs. of seed (Rs. 0-4-0). A pair of bullocks and a man and 3 women for ·32 day.
	Tur by do. do. ...	0 12 1	17 lbs. of seed (Rs. 0-6-9). A pair of bullocks and a man and 3 women for ·27 day.
	Juar by tifan (country drill) ...	0 14 7	14 lbs. of seed (Rs. 0-5-8). A pair of bullocks and 2 men for ·49 day.
	Gram by nari-nager (drill plough) ...	2 0 3	40 lbs. of seed (Rs. 1-2-0). A pair of bullocks and 2 men for ·79 day.
	Linseed by tifan (country drill) ...	1 5 2	13 lbs. of seed (Rs. 0-12-5). Two pairs of bullocks and 3 men for ·26 day.
	Wheat by nari-nager (drill plough) ...	3 5 10	80 lbs. of seed (Rs. 2-6-4). Two pairs of bullocks and 3 men for ·46 day.
Cost of manure (excluding loading, carting and spreading).	Saltpetre	20 0 0	240 lbs. @ Rs. 6-10-8 per maund.
	Bone-dust	3 6 0	360 lbs; cost of collecting Re. 0-8-0 per maund and of crushing Re. 0-4-0 per maund.
	Cattle-dung	10 0 0	160 maunds @ Re. 0-1-0 per maund.
	Ashes of dung	11 0 8	160 maunds dung @ Re. 0-1-0 per maund and drying and burning dung for ashes Re. 1-0-8 per acre.
	Green manuring with san hemp ...	8 4 6	120 lbs. of seed (Rs. 2-11-4); sowing (Re. 0-11-8); covering seed by harrow (Re. 0-2-6) and cutting and ploughing (Rs. 4-11-0).
	Do. with bawachi (*Psorolia corilifolia*)...	6 5 0	Cutting and carting bawachi (Rs. 1-12-7) and ploughing (Rs. 4-8-5).
Cost of harvesting.	Picking cotton	0 5 4	2 women for 1·77 days each picking.
	Reaping juar	0 14 8	8 Do. 1·22 days.
	Do. gram	0 7 1	7 Do. ·67 day.
	Do. linseed	0 2 10	5 Do. ·37 „
	Do. wheat	0 4 3	4 Do. ·70 „
Cost of threshing and cleaning.	Ginning cotton (by country handcharka) ...	1 11 10	15 women for 1·23 days average produce per acre 298 lbs. of seed cotton.
	Threshing and cleaning juar ...	0 8 4	1 man and 1 woman for 1·85 days; average produce per acre 579 lbs. of grain and 2663 lbs of karbi.
	Do. gram ...	2 0 5	4 bullocks, 1 man, 2 women and 2 boys for 1·01 days average produce per acre 346 lbs of grain and 546 lbs of straw.
	Do. linseed ...	0 12 3	4 bullocks, 1 man, 2 women and 2 boys for ·38 day; average produce per acre 168 lbs of grain and 286 lbs of stalks.
	Do. wheat ...	1 12 5	4 bullocks, 1 man, 3 women and 2 boys for ·84 day; average produce per acre 518 lbs of grain and 746 lbs of straw.

Annexure C.

Statement showing the Rates used for valuing the produce of the Experimental Farm, Nagpur, during the year 1895-96.

Name of produce.		Value.		Remarks.
		Rate.	Per.	
		Rs. a. p.		
Cotton lint (according to quality)		90 0 0	Bojha of 345 lbs.	
		89 0 0		
		85 0 0		
		65 0 0		
		64 0 0		
Cotton seed		8 0 0	Khandi of 640 lbs.	
Juar	Grain	10 0 0	„ 390 lbs.	
	Karbi	25 0 0	Sheaves 1,000 ...	About 3460 lbs.
Tur	Grain	10 8 0	Khandi of 421 lbs.	
	Stalks	0 12 0	8 bundles ...	About 560 lbs.
	Bhusa	1 8 0	One cart-load ...	About 478 lbs.
Gram	Grain	13 0 0	Khandi of 390 lbs.	
	Chaff	1 8 0	One cart-load ...	About 478 lbs.
Linseed (chaval-katha)	Grain	21 0 0	Khandi of 385 lbs.	
	Stalks and bhusa ...	1 8 0	One cart-load ...	About 478 lbs.
Wheat (haura) Nagpur	Grain	14 0 0	Khandi of 400 lbs.	
	Straw	1 12 0	One cart-load ...	About 478 lbs.
Wheat (pissi) Nagpur	Grain	13 0 0	Khandi of 400 lbs.	
	Straw	1 12 0	One cart-load ...	About 478 lbs.

Annexure D.

EXPERIMENTAL FARM, NAGPUR.

Programme of Experiments as it stood on the 1st *June* 1896.

Number of field.	Purpose of Experiment.	Crop. 1st year.	Crop. 2nd year.	Crop. 3rd year.	Special treatment. 1st year.	Special treatment. 2nd year.	Special treatment. 3rd year.	Year (commencing June) in which experiment started.	Remarks.
				Manure Experiments.					
A—1	Effect on wheat grown continuously of different kinds of manures applied year after year with irrigation.	Wheat ...	Wheat ...	Wheat ...	Saltpetre ...	Same as in first year.	Same as in first year.	1883 ...	Cropping and treatment similar every year. Quantities per acre. Saltpetre 240 lbs. Bonedust 360 lbs. Cattle dung 160 mds. Ashes of 160 mds. dung.
—2		Do. ...	Do. ...	Do. ...	Bonedust ...	Do. ...	Do. ...		
—3		Do.	Do. ...	Do. ...	Saltpetre and bonedust ...	Do. ...	Do. ...		
—4		Do. ...	Do. ...	Do. ...	Cattle dung ...	Do. ...	Do. ...		
—5		Do. ...	Do. ...	Do. ...	Dung and bonedust ...	Do. ...	Do. ...		
—6		Do. ...	Do. ..	Do. ...	Ashes of dung ...	Do. ...	Do. ..		
—7		Do. ...	Do. ...	Do. ...	*Nil.* ...	Do. ...	Do. ...		
—8		Do. ...	Do. ...	Do. ...	San hemp ploughed in green.	Do. ...	Do. ...		
B—1	Do. without irrigation ...	Wheat ...	Wheat ...	Wheat ...	Saltpetre ...	Same as in first year.	Same as in first year.	1890 ...	Do. Do.
—2		Do. ...	Do. ...	Do. ...	Bonedust ...	Do. ...	Do. ...		
—3		Do. ...	Do. ...	Do. ...	Saltpetre and bonedust ...	Do. ..	Do. ...		
—4		Do. ...	Do. ...	Do. ...	Cattle dung ...	Do. ...	Do. ...		
—5		Do. ...	Do. ...	Do. ...	Dung and bonedust ...	Da. ...	Do. ...		
—6		Do. ...	Do. ...	Do. ...	Ashes of dung ...	Do. ...	Do. ...		
—7		Do. ...	Do. ...	Do. ...	*Nil.* ...	Do. ...	Do. ...		
—8		Do. ...	Do. ...	Do. ...	San hemp ploughed in green.	Do. ...	Do. ...		
C—1	Effect on linseed grown continuously of different kinds of manures applied year after year.	Linseed ...	Linseed ...	Linseed ...	Saltpetre ...	Same as in first year.	Same as in first year.	1895 ...	Cropping and treatment similar every year.
—2		Do. ...	Do. ...	Do. ...	Bonedust ...	Do. ...	Do. ...		
—3		Do. ...	Do. ...	Do. ...	Tarota to be ploughed in green.	Do. ...	Do. ...		
—4		Do. ...	Do. ..	Do. ...	Cattle dung ...	Do. ...	Do. ...		
—5		Do. ...	Do. ...	Do. ...	Bawachi to be ploughed in green.	Do. ...	Do. ...		
—6		Do. ...	Do. ...	Do. ...	Ashes of dung ...	Do. ...	Do. ...		
—7		Do. ...	Do. ...	Do. ...	*Nil.* ...	Do, ...	Do. ...		
—8		Do. ...	Do. ...	Do. ...	San hemp ploughed in green.	Do. ...	Do. ...		
Ville—1	Practical method of soil analysis by using chemical manures, as devised by M. Georges Ville.	Linseed ...	Linseed ...	Linseed ...	Amm. Chlor. cal. Superphos: pot sulph and calsulph and Cal. suph. As in 1 less calsuper phosphate.	Same as in first year.	Same as in first year.	1895 ...	Cropping and treatment similar every year. Quantities per acre. Amm. chlor. 140 lbs. Cal. Superphosp 180 lbs. Potassic Sulphate 90 lbs. Calcic Do. 100 lbs
—2		Do. ...	Do. ...	Do. ...		Do. ...	Do. ...		
—3		Do. ...	Do. ...	Do. ...	As in 1 less anm. chlor.	Do. ...	Do. ...		
—4		Do. ...	Do. ...	Do. ...	No manure ...	Do. ...	Do. ...		
—5		Do. ...	Do. ...	Do. ...	As in 1 less potassic sulphate.	Do. ...	Do. ...		
—6		Do. ...	Do. ...	Do. ...	As in 1 less calcic sulphate.	Do. ...	Do. ...		

18—1	Relative effect of green manuring, box dung and stall dung.	Wheat	Wheat ...	Wheat ...	Psorolia Corilifolia to be sown and ploughed in green.	Same as in first year.	Same as in first year.	1890 ...	Cropping and treatment similar every year.
—3		Do. ...	Do. ...	Do. ...	*Nil.*				
—3		Do. ...	Do. ...	Do. ...	Box dung ...	Do. ...	Do. ...		
—4		Do. ...	Do. ...	Do. ...	Stall dung ...	Do. ...	Do. ...		
32—1	Effect on wheat of green manuring with papilionaceous weeds (*Psorolia corilifolia*).	Wheat ..	Wheat ...	Wheat ...	Green manuring with weeds cut from waste land.	Same as in first year.	Same as in first year.	1891 ...	Do.
—2		Do. ...	Do. ...	Do. ...	*Nil.*	Do. ...	Do. ...		
23—1	Effect on wheat of manuring with saltpetre in different rates per acre without irrigation.	Wheat ...	Wheat ...	Wheat ...	*Nil.*	Same as in first year.	Same as in first year.	...	Duration of the experiment is of one year only.
—2		Do. ...	Do. ...	Do. ...	Saltpetre 240 lbs. per acre.	Do. ...	Do. ...		
—3		Do. ...	Do. ...	Do. ...	Saltpetre 80 lbs. per acre.	Do. ...	Do. ...		
68—1	Do. with irrigation ...	Wheat ...	Wheat ...	Wheat ...	Do. ...	Same as in first year.	Same as in first year.	...	Do
—2		Do. ...	Do. ...	Do. ...	Do. ...	Do. ...	Do. ...		
—3		Do. ...	Do. ...	Do. ...	Do. ...	Do. ...	Do. ..		
15—1	To test the effect of manuring at different times of the year.	Wheat ...	Wheat ...	Wheat ...	Manured with dung in June.	Same as in first year.	Same as in first year.	...	Duration of the experiment is of two years only.
—2		Do. ...	Do. ...	Do. ...	Manured with dung in August.	Do. ...	Do. ...		
22—1	Do ...	Wheat ...	Wheat ...	Wheat ...	Do. ...	Same as in first year.	Same as in first year.	...	
—2		Do. ...	Do. ...	Do. ...	Manured with dung in June.	Do. ...	Do. ...		
—3		Do. ...	Do. ...	Do. ...	Manured with dung in August.	Do. ...	Do. ...		Do.
55—1	To test the effect of nitrogenous and non-nitrogenous crops on wheat.	Wheat ...	Wheat ...	Wheat ...	San hemp ploughed in green.	Same as in first year.	Same as in first year.	...	Do.
—2		Do. ...	Do. ...	Do. ...	Ambadi ploughed in green	Do. ...	Do. ..		
47N—1	Do. ...	Wheat ...	Wheat ...	Wheat ...	Do. ...	Same as in first year.	Same as in first year.	...	Do.
—2		Do. ...	Do. ...	Do. ...		Do. ...	Do. ..		
9—1	To test the effect of phosphatic manures on different oil seeds suggested by Dr. Leather.	Til and Kardi ...	Til and Kardi ...	Til and Kardi ...	*Nil.*	Same as in first year.	Same as in first year.	...	Duration of the experiment is of one year only.
—2		Do. ...	Do. ...	Do. ...	Saltpetre ...	Do. ...	Do. ...		
—3		Do. ...	Do. ...	Do. ...	Burnt bones ...	Do. ...	Do. ...		
—4		Do. ...	Do. ...	Do. ...	Raw bones ...	Do. ...	Do. ...		
—5		Do. ...	Do. ...	Do. ...	Raw bones and saltpetre...	Do. ...	Do. ...		
59—1	Do. ...	Linseed and Mustard.	Linseed and Mustard.	Linseed and Mustard.	*Nil.*	Same as in first year.	Same as in first year.	...	Do.
—2		Do. ...	Do. ...	Do. ...	Saltpetre ...	Do. ...	Do. ...		
—3		Do. ...	Do. ...	Do. ...	Burnt bones ...	Do. ...	Do. ..		
—4		Do. ...	Do. ...	Do. ...	Raw bones ...	Do. ...	Do. ...		
—5		Do. ...	Do. ...	Do. ...	Raw bones and saltpetre.	Do. ...	Do. ...		
42N—N.	To test the effect of Potassic and phosphatic manures on tur. A nitrogen fixing crops.	Tur ...	Tur ...	Tur ...	Powdered bones and Potassic sulphate.	Same as in first year.	Same as in first year.	...	Do.
—S.		Do. ...	Do. ...	Do. ...	*Nil.*	Do. ...	Do. ...		

Annexure D.—(*Contd.*)

Number of field.	Purpose of Experiment.	Crop. 1st year.	Crop. 2nd year.	Crop. 3rd year.	Special treatment. 1st year.	Special treatment. 2nd year.	Special treatment. 3rd year.	Year (commencing June) in which experiment started.	Remarks.
			Rotation Experiments without Manures.						
29—1	Effect of rotations with wheat	Wheat	Wheat	Wheat	*Nil.*	*Nil.*	*Nil.*	1890	Two year rotation *i. e.*, the fourth year will follow the second.
—2		Do.	Fallow	Do.	Do.	Do.	Do.		
—3		Do.	Gram	Do.	Do.	Do.	Do.		
—4		Do.	Juar and tur	Do.	Do.	Do.	Do.		
—5		Do.	Kodon	Do.	Do.	Do.	Do.		
57—1	Effect of rotations with linseed	Linseed	Linseed	Linseed	*Nil.*	*Nil.*	*Nil.*	1890	Do.
—2		Do.	Gram	Do.	Do.	Do.	Do.		
—3		Do.	Cotton	Do.	Do.	Do.	Do.		
—4		Do.	Tur	Do.	Do.	Do.	Do.		
61—1	Effect of rotations with cotton	Cotton and tur	Cotton and tur	Cotton and tur	*Nil.*	*Nil.*	*Nil.*	1893.	Do.
—2		Do.	Wheat	Do.	Do.	Do.	Do.		
—3		Do.	Gram	Do.	Do.	Do.	Do.		
			Rotation Experiments with Manures.						
14—1	Effect of green manuring with san hemp. on wheat with fallow interposed on wheat in rotation with cotton.	Fallow	Wheat	Fallow	Green manuring with san hemp.	*Nil.*	Green manuring with san hemp.	1891	Cropping and treatment similar every year.
—2		Do.	Do.	Do.	*Nil.*	Do.	*Nil.*		
—3		Wheat	Cotton	Wheat	Green manuring with san hemp.	Do.	Green manuring with san hemp.		
—4		Do.	Do.	Do.	*Nil.*	Do.	*Nil.*		
17—1	Effect on wheat and cotton in rotation of green manuring Papilionaceous weeds (Psorolia corilifolia.)	Wheat	Cotton	Wheat	Green manuring with weeds cut from waste land.	*Nil.*	Green manuring with weeds cut from waste land.	1890	Do.
—2		Do.	Do.	Do.	*Nil.*	Do.	*Nil.*		
42—1	Relative effect of dung and bone dust applied each year on juar and linseed grown in rotation.	Juar	Linseed	Juar	Dung.	Dung	Dung	1890	Manures continued every year; crops to be in rotation.
—2		Do.	Do.	Do.	*Nil.*	*Nil.*	*Nil.*		
—3		Do.	Do.	Do.	Bone dust.	Bone dust	Bone dust		
44—1	Relative effect on cotton and wheat in rotation of box-dung, stall dung and bone dust.	Cotton	Wheat	Cotton	Stall dung.	Same as in first year	Same as in first year	1890	Do.
—2		Do.	Do.	Do.	Box dung.	Do.	Do.		
—3		Do.	Do.	Do.	*Nil.*	Do.	Do.		
—4		Do.	Do.	Do.	Bone dust.	Do.	Do.		
63—1	Relative effect on linseed and cotton in rotation of box dung and stall dung applied in alternate years only.	Linseed	Cotton	Linseed	*Nil.*	Box dung	*Nil*	1890	To be manured with the same kinds of manure every alternate year and crop to be in rotation.
—2		Do.	Do.	Do.	Do.	*Nil*	Do.		
—3		Do.	Do.	Do.	Do.	Stall dung	Do.		

65—1 —2	Effect of liming soils ...	Wheat ... Do. ...	Cotton ... Do. ...	Wheat ... Do. ...	Caustic lime ... *Nil* ...	*Nil* ...	*Nil* ...	1890 ..	No. 1 was limed in 1890-91 and another application of lime to be made after 12 years. The crops to be in rotation and manures, especially organic ones, to be applied to both the plots equally occasionally.

Experiments with mixtures of Crops.

55—3 —4 —5	Effect of mixing crops, the principal one being cotton.	Cotton. Cotton and tur in the proportions of 6 lines to 2 cotton and juar in the proportion of 6 lines to 2.	Same as in first year Do. ... Do. ...	Same as in first year. Do. ... Do. ...	*Nil* ... Do. .. Do. ...	*Nil* ... Do. ... Do. ...	*Nil* ... Do. ... Do. ...	1895 ...	Cropping similar every year. Manure to be applied occasionally.
25—1 —2	Effect of mixing crops wheat and a leguminous crop (gram).	Wheat ... Wheat and gram ...	Same as in first year. Do. ...	Same as in first year Do. ...	*Nil* .. Do. ...	*Nil* ... Do. ...	*Nil* ... Do. ...	1890 ...	Do.

Experiments with Tillage.

21—1 —2 —3	Effect of tillage to various depths.	Wheat ... Do. ... Do. ..	Wheat ... Do. ... Do. ...	Wheat ... Do. ... Do. ...	To be ploughed every year ... To be hoed (bakhared) every year ... To be ploughed every third year, being hoed during the other two.			1890 ...	Croping and treatment similar every year.

Variety of Crops.

34—1 —2 —3	To test the yield of varieties of cotton.	Cotton Garo Hill ... Do. upland Georgian. Do. Nimari ...	Same as in first year. Do. ... Do. ...	Same as in first year. Do. ... Do. ...	To be manured with kachara dung.	Same as in first year. Do. ... Do. ...	Same as in first year. Do. ... Do. ...	...	Duration of the experiment is of two years only.
37—1 —2 —3	Do	Cotton Garo Hill ... Do. upland Georgian. Do. Nimari ...	Same as in first year. Do. ... Do. ...	Same as in first year. Do. ... Do. ...	Do. ...	Same as in first year. Do. ... Do. ...	Same as in first year. Do. ... Do. ...	...	Do.
39—1 —2	To test the effect of early and late sowing of maize.	Maize ... Do. ...	Maize ... Do. ..	Maize ... Do. ..	Poudrette ...	Same as in first year. Do. ...	Same as in first year. Do. ...	...	Duration of the experiment is of one year only. 1st plot to be sown on 20th May and 2nd plot on 20th June.
40—1 —2	To test the effect of rust proof varieties of wheat.	Jondhala wheat ... Bansi wheat ...	Same as in first year Do. ...	Same as in first year. Do. ...	Dung ... Do. ...	Same as in first year. Do. ...	Same as in first year. Do. ...	...	Duration of the experiment is of one year only.

Annexure D.—(*Concld.*)

Number of field.	Purpose of Experiment.	Crop. 1st year.	Crop. 2nd year.	Crop. 3rd year.	Special treatment. 1st year.	Special treatment. 2nd year.	Special treatment. 3rd year.	Year (commencing June) in which experiment started.	Remarks.
				Experiments with Plant Diseases.					
13—1	To test the effect of sulphate of copper solution on tur.	Tur ...	Tur ..	Tur ...	Sulphate of copper solution.	Same as in first year.	Same as in first year.	...	Duration of the experiment is of one year only.
—2		Do. ...	Do. ...	Do. ...	*Nil.* ...	Do. ...	Do. ...		
				Methods of Cultivation.					
26—1	To test the effect of rolling the field with a stone roller after the green manure is ploughed in.	Wheat ...	Wheat ...	Wheat ...	San hemp ploughed in and rolled.	Same as in first year.	Same as in first year.	...	Duration of the experiment is of two years only.
—2		Do. ...	Do. ...	Do. ...	San hemp ploughed in.	Do. ...	Do. ...		
—3		Do. ...	Do. ...	Do. ...	San hemp ploughed in and rolled.	Do. ...	Do. ...		
—4		Do. ...	Do. ...	Do. ...	San hemp ploughed in.	Do. ...	Do. ...		
35—1(a)	To test the effect of planting sugar-cane with tops and set.	Sugar-cane ...	Sugar-cane ...	Sugar-cane ...	Poudrette ...	Same as in first year.	Same as in first year.	...	Duration of the experiment is of one year only.
—1(b)		Do. ...	Do. ...	Do. ...	Do. ...	Do. ...	Do. ...		

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Annexure E.

Inspection Note on the Nagpur Experimental Farm.

I visited the Nagpur Farm on February 20th, 29th and March 1st and have discussed the various experiments with Mr. Joshi. We have agreed upon the desirability of making the following remarks and alterations in the programme.

2. *The A and B Series.*—These two series of plots are reserved for the growth of wheat manured with different materials, the A series of plots being unirrigated, whilst the B series is irrigated. The tank from which the water supply is drawn is closely contiguous to *A* series (*i. e.*, the plots which are *not* to be irrigated) and the water has to be carried to *B* series past A series. Mr. Joshi finds that this water distinctly affects the borders of A series, and he has raised the question whether this should not be avoided in future. Certainly this should be done, and it can be effected in two ways (1) by making a masonry channel from the tank to the B plots, (2) by reversing the treatment of the two series of plots. The latter method is perfectly practical, for the manuring would not be interfered with at all, and the cost of the masonry channel would be avoided. All that is necessary is to irrigate A series in future and have B series unirrigated. In the Report for 1896-97 the figures of outturns of A series from the commencement should be placed under paragraph for B series, whilst those for B series (from the commencement) should be transferred to the paragraph "A series" and an explanatory note made.

3. *Oilseeds.*—There appears to be a certain amount of evidence from the present cold weather's experiments with linseed on "C" series that bones may prove of value for linseed. They have never been shown to be of much use for cereals, and it would form a useful experiment if the effect of phosphates was tried for different oilseeds. "C" series will be continued for the growth of linseed and in addition four other series of plots might be taken up for linseed, mustard, til and safflower manured in each case as follows:—

Plot No. 1. *Nil.*

Plot „ 2. Saltpetre containing 20 lbs. nitrogen.

Plot „ 3. Burnt bone o 100 lbs. phosphate.

Plot „ 4. Raw bone X" Nitrogen 100 lbs. phosphate.

Plot „ 5. Raw bone and saltpetre X" Nitrogen 100 lbs. phosphate, 20" Nitrogen.

4. "*Top dressing wheat with saltpetre.*"—In field 68, one of the plots, No. III, of wheat was originally "top dressed" with saltpetre and no advantage was gained. But I find during conversation with Mr. Joshi that the saltpetre was "top dressed" at a much later period of growth than is the usual practice in Europe. I would recommend that three other plots be taken and manured with saltpetre in the same quantities as in the case plot of No. 2 of field 68. These plots would probably have to be in land, which cannot be irrigated, and therefore they should be treated exactly as has been the case on plots in field 68 for the last two years, *i. e.*, the saltpetre would be drilled in with the seed. The plots in field 68 would then be top dressed again in the following manner:—The 80 lbs. saltpetre should be "top dressed" when the wheat is about 4" high and of the 240 lbs. apply 80 lbs. with the wheat at sowing time, and the other 160 lbs. when the wheat is about 4" high. These plots will be irrigated.

5. In the Farm Report for 1894-95 there are two sections denominated "Rotation Experiments" and "Experiments with rotation and manures". These would be more aptly described as "Rotation Experiments without manures" and "Rotation Experiments with manures". The only difference between the two sets of experiments would be thus more clearly set forth.

6. I visited the Telinkheri fuel and fodder reserve, and the results which Mr. Joshi has obtained by the sale and use of the grass appear to be eminently satisfactory. The trees are not growing very rapidly, but one cannot expect great results on such poor land. Mr. Joshi recommends irrigating a portion of the trees by hand labour during the hot weather, and I think the suggestion might be acted upon. The expense would not be very great, and if the trees once got a fair hold, they might get along well enough by themselves. At least the experiment is worth making for one or two seasons, especially as the money realised by the sale of grass would readily provide for this small additional expense.

7. The experiments on the assimilation of nitrogen which Mr. Fuller has recommended have been made, and I have assisted Mr. Joshi in separating the plants from the sand and have taken photographs of the plants. I shall analyse the several materials and will forward the results when completed.

8. It would be advisable to submit samples of the manures used in the cold weather experiments to me for analysis about August 1st.

The 10th March 1896. J. WALTER LEATHER.

Secretariat Press, Nagpur:—A. H. C. C. & R. D., 18-11-96. 360.